



PROJECT
10009712

US EPA RECORDS CENTER REGION 5



473977

**REMEDIAL DESIGN/REMEDIAL ACTION
HEALTH AND SAFETY PLAN**

**WINNEBAGO RECLAMATION LANDFILL SITE
(PAGEL'S PIT)
WINNEBAGO COUNTY, ILLINOIS**

SEPTEMBER 1993

PREPARED BY:
WINNEBAGO RECLAMATION SERVICES, INC.
ROCKFORD, ILLINOIS
AND
WARZYN INC.
ADDISON, ILLINOIS





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A handwritten signature in cursive script that reads "Alan J. Schmidt".

Alan J. Schmidt, C.P.G.
Project Manager

A handwritten signature in cursive script that reads "Jody L. Bernstein".

Erik A. Goplin *for*
Health and Safety Manager



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INTRODUCTION

This Health and Safety Plan (HASP) is written to provide specifications for general site safety guidelines and requirements specific to Warzyn Inc. (Warzyn) in conducting predesign studies to support design of the groundwater extraction and treatment remedial design specified in the Groundwater RD Work Plan. As other on-Site activities are undertaken to support design of other required remedial actions (landfill gas/leachate management and soil cover) and as respective remedial actions, compliance monitoring, and operations and maintenance activities are developed and initiated, this HASP will be amended, as required, to cover Warzyn personnel completing the activities and to comply with applicable health and safety regulations for specific activities.

This HASP does not supersede or in any way relieve subcontractors of their obligations under any applicable OSHA regulations including 29 CFR 1910: Occupational Safety and Health Standards and 29 CFR 1926: Health and Safety Regulations for Construction.

Each contractor at the Winnebago Reclamation Landfill (WRL) Site must ensure the health and safety of their employees and provide the necessary training and guidelines to ensure a safe work environment. Contractors working at the site will review this HASP and meet or exceed safety requirements established in this document.

The health and safety procedures set forth in this HASP are based on the WRL Site conditions and chemical hazards known or expected to be present, using data available at the time this HASP was written. This HASP is intended solely for the use by Warzyn personnel involved in the remedial design/remedial action activities as outlined in the Record of Decision and the Statement of Work for the WRL Site and described in this HASP. This HASP is subject to review and revision when it is deemed necessary by actual WRL Site conditions encountered during the field activities.

All operations and equipment will comply with OSHA Regulations 29 CFR 1910.120 "Hazardous Waste Operations and Emergency Response" and applicable parts of OSHA 29 CFR 1910 and 1926. Warzyn personnel engaged in the performance of RD/RA work at the WRL Site (covered personnel) will have received 40 hour OSHA 1910.120 Hazardous Materials Training, 24 hours of supervised on-the-job training, and personnel will also have undergone a medical/physical examination meeting the requirements of 29 CFR 1910.120(i). All covered personnel will have access to their medical records.

Before on-Site operations begin, all covered personnel will have received a copy of the HASP and revisions relevant to their specific work tasks. All covered personnel will also receive a pre-entry safety briefing which will cover the following: background information on the site history (physical/chemical hazards present), site operations/organization, work zones, site control, personal protective equipment, site/personnel monitoring, decontamination procedures, personal hygiene, and contingency response. A copy of this HASP will be posted and available on site.

SITE SUMMARY

2.1 SITE LOCATION AND DESCRIPTION

The WRL Site occupies about 100 acres on the west side of Lindenwood Road, south of Baxter Road and about five miles south of Rockford, Illinois (see Figure 1). The landfill has been in operation since about 1972 and the operator has estimated that five to seven years of capacity remain. Municipal refuse and sewage treatment plant sludge have been the primary wastes accepted at the site. A limited amount of Illinois special non-municipal wastes have also been disposed of at the facility.

2.2 SITE HISTORY

The landfill is located at a former sand and gravel quarry. It has been sequentially constructed and filled in several sections. Development has generally occurred in an east to west direction, first in the southern half and then in the northern half. The base of the landfill is now complete and the landfill wastes cover approximately 47 acres. Leachate is pumped from a collection system at the base of the landfill to a leachate pond located on top of the landfill. The leachate is aerated in the pond and transported by pipeline to the wastewater treatment plant in Rockford.

Wastes to be disposed of in the landfill enter through a common gate where there is a scale. The hauler takes the wastes to the working face of the landfill where they are unloaded. The operator at the working face compacts the wastes into the active section of the landfill. A six-inch cover is applied over the wastes daily; this generally consists of sand and clay with some gravel. When an area has been filled to an intermediate elevation (the area will not be receiving waste for 60 days and the final permitted elevation has not been reached), a compacted layer of *additional suitable material is placed on the surface. Much of the present landfill*

is covered with this intermediate cover. Further filling of the landfill is expected to bring the western end of the landfill to the final top grade. At that time, filling will continue from west to east until final elevation over the entire landfill is reached. At closure the landfill will contain an estimated six million cubic yards of wastes. The proper side slopes will be maintained with the final filling.

Around 1980, landfill gas, consisting primarily of methane and carbon dioxide, was discovered at the boundary of the landfill near Lindenwood Road, leading to the installation of a gas extraction system in the southeast corner of the landfill. Later additional wells were installed in the northeast corner. These wells were connected to a flare, where the gas was burned. In 1981, operation and maintenance of the landfill gas extraction system was further upgraded. In 1984, the existing gas extraction wells were replaced by a network of 70 wells located in the eastern, non-active portion of the landfill. The gas is collected from the wells through the use of blowers and a system of header pipes and is used as a fuel source in the sludge drying operation. In November 1988, 21 additional wells were installed in the central section of the landfill and connected to the system. The gas extraction wells are also used for the removal of leachate from the landfill. When used for this purpose, a gas extraction well is disconnected from the system and a portable pump is placed in the well. The pump transfers the leachate to the leachate pond.

2.3 SCOPE OF WORK

Presently identified actions to be conducted at the WRL Site include:

- Predesign studies, as detailed in the Groundwater RD Work Plan, to define the extent of groundwater contamination to the west of the landfill and to better establish aquifer characteristics for design
- Remedial actions, following development of design documents and approval by the U.S. EPA, including:
 - groundwater extraction and treatment
 - leachate and landfill gas management
 - final cover
- Compliance monitoring
- Operation and maintenance (O&M) activities

Specific predesign activities to be conducted by Warzyn to support groundwater extraction and treatment system design are summarized below. Refer to the Groundwater RD Work Plan for a more detailed description.

- Phase I of the project consists of collecting groundwater samples from 19 monitoring wells and piezometers, and measuring water elevations at Warzyn wells located at the WRL facility.
- Phase II consists of installing and sampling two monitoring well nests, most likely consisting of two wells each. One shallow well will be completed in the water table aquifer, the deeper well will be completed in unconsolidated materials or dolomite bedrock, whichever is present at the vertical extent of contamination. Soil borings will be collected during this phase.
- Phase III consists of installing an extraction well and performing a pumping test, using that extraction well.

2.4 PAST SAMPLE RESULTS

Refer to Warzyn's Groundwater RD Work Plan and Table 1 for discussion of previous sampling results.

2.5 TOPOGRAPHY

Surface topography of the WRL Site consists primarily of an area of high relief resulting from the landfill waste disposal operations. The topography surrounding the landfill area is relatively flat to gently rolling. The ground surface ranges from approximately 790 feet mean sea level (MSL) on top of the landfill to approximately 706 feet MSL at Killbuck Creek just west of the landfill.

Unconsolidated materials range from 8 feet in the bedrock uplands to the east of the site to greater than 70 feet at the western boundary of the site. The unconsolidated materials are predominantly sand and gravel or fine to coarse sand. The bedrock underlying the unconsolidated materials is composed of fractured dolomite. The bedrock surface elevation is highly variable due to the paleoerosional features. A bedrock valley begins to form under the WRL Site and deepens to the west.

2.6 LOCALE

The site is located in a predominantly rural unincorporated area. It is bounded on the west by Killbuck (or Kilbuck) Creek and on the east by Lindenwood Road. Killbuck Creek, a perennial stream, merges with the Kishwaukee River about 2.5 miles northwest of the WRL Site. The Kishwaukee River merges with the Rock River about 1.5 miles northwest of the confluence of Killbuck Creek and the Kishwaukee River. The WRL Site is located on a topographic high between Killbuck Creek to the west and unnamed intermittent streams to the north and the south. Land use around the site is a mix of agricultural, rural residential, commercial, and industrial.

Access to that part of the WRL Site closest to Lindenwood Road is restricted by a chain link fence. Access to the rest of the site is restricted by other fencing and the topography, which includes steep slopes and heavily wooded area.

2.7 KEY PERSONNEL

The following key personnel are presently involved with the project. As the various remedial design and remedial actions are initiated, it is anticipated that there will be changes and/or additions of key personnel. Any such changes and/or additions will be documented by addendums to this document in respective RD Work Plans or design documents.

U.S. EPA Project Manager:	Bernard Schorle
IEPA Project Manager:	Fred Nika

Winnebago Reclamation Service, Inc. Personnel

On-Site Health and Safety Manager:	Tom Hilbert
Alternate:	John Lichty

Warzyn Inc.

Project Manager:	Al Schmidt
Alternate:	Sandra Ihm
Site Safety Officer:	(To be determined prior to start of field activities)

Warzyn Health and Safety Manager (HSM) - The Warzyn Health and Safety Manager is responsible for maintaining proper medical surveillance (including pre-entry and exit examinations, if required), providing hazard communication information, training employees in safe operating procedures, and advising the Project Manager on any matters concerning the health and safety of Warzyn

employees or the public. The HSM must be consulted before any changes in the recommended procedures or levels of protective clothing are made.

Warzyn Project Manager - The Warzyn Project Manager (PM) has the primary responsibility for the fulfillment of the terms of the RD/RA Work Plan and respective RD Work Plans. The PM must oversee operations and ensure that all legal and safety requirements are met. It is the PM's duty to keep the project on schedule, within budget, and to communicate with the designated WRL Site contact regarding the progress toward the specified goals.

Warzyn Site Safety Officer - The Warzyn Site Safety Officer is the on-Site coordinator and overseer of operations. It is his duty to maintain site security, supervise the laborers and technicians, ensure that all procedures (health and safety, decontamination, protective equipment, etc.) are followed. The Site Safety Officer (SSO) has on-Site authority to upgrade levels of protection and shut down operations as necessary. Downgrades in protection require consultation with the Warzyn Health and Safety Manager (HSM).

2.8 PROPOSED PROJECT START DATE

Warzyn's predesign studies for the groundwater extraction system are proposed to begin in September/October 1993 based on anticipated U.S. EPA review and approval of the RD/RA Work Plan and Groundwater RD Work Plan.

3

HAZARD AND TASK SUMMARY

3.1 TASKS

Remedial Design/Remedial Action activities will include the construction or performance of the following activities, each of which is more fully described in the Statement of Work and RD/RA Work Plan for the WRL Site:

- A. Identification of Extent of Groundwater Contamination
- B. Groundwater Extraction and Treatment System
- C. Leachate Management System
- D. Landfill Gas Management System
- E. Final Cover System
- F. Control of Air Emissions
- G. Groundwater, Soil Gas, Leachate, Air, and Water Supply Monitoring
- H. Alternative Water Supply

Ongoing activities not part of the remedy include waste disposal. Truck traffic related to waste disposal is a potential hazard. As indicated in Section 1, this HASP covers items A. and B. HASP Addendums will be prepared to cover the remaining remedial activities if conducted by Warzyn and its contractors.

In case covered personnel encounter containers with unknown contents, work in the area will temporarily cease and all personnel will evacuate the area. The HSM will be called.

If asbestos containing materials (ACM) are encountered during operations, work will temporarily cease. Common application of ACM includes pipe wrapping, mud on pipe joints, boiler cover, spray-on ceilings, and ceiling and floor tiles. Potential exposure to asbestos fibers is generally related to friability and condition of the ACM. Friable ACM contains over one percent asbestos and can be crushed or dispersed by hand, and is commonly represented by pipe wrap, boiler cover and

spray-on insulation. Non-friable ACM includes materials such as roofing tar and floor tile. Personnel will evacuate the area and the HSM will be contacted.

3.1.1 Potential Hazards

Covered personnel may be exposed to the inorganic, volatile organic, and semi-volatile organic compounds detected at the Site through inhalation and dermal (skin) absorption. The possible volatile air emissions concentrations depend on a variety of physical factors. These factors include concentration of volatiles in leachate, groundwater, temperature, the operation of the methane gas extraction system and wind velocity. Refer to Appendix L-WRL Site Job Task Potential Hazards.

3.1.2 Precautions

The major hazard of concern at the WRL Site will be the possible exposure to a variety of known and unknown chemicals. The chemicals may be exposed during intrusive activities, during the installation of the landfill cover, and during compliance monitoring and O&M activities. Drilling involves lifting of heavy equipment, drill-bit spinning, and impact noise. Special safety consideration must be demonstrated during operation of drilling equipment. These include the use of hard hats, hearing protection, steel-toe, steel-shank boots, and safety glasses with side shields by personnel working in the vicinity. The contractor performing drilling operations must train their personnel in the safe use of equipment and ensure all OSHA requirements are met. Refer to Appendix M, Subcontractor's Vehicle and Drill Rig Safety Plan. The third hazard of concern is general slips, trips, and falls associated with rugged terrain. It should be noted that RD/RA activity will take site workers through a variety of terrain and that precaution to slips, trips, and falls should be taken. A fourth hazard concern involves electrical/mechanical hazards associated with the installation of pumping and groundwater treatment equipment. The contractor performing electrical or mechanical work must abide by all applicable OSHA regulations. Ground fault circuit interruptors must be used on all 110v 15 to 20 amp circuits. A fifth hazard of concern involves the possible exposure to chemicals exposed during cover installation and the heavy equipment and vehicles used in the cover installation activities. Appropriate personal protective equipment and air monitoring should provide for the safety of these personnel.

Care should be taken in loading and hauling any contaminated material to avoid spilling and overloading. If necessary, or required by applicable laws, loads will be covered with tarps.

To avoid stormwater runoff from a contaminated area, a soil berm will be constructed as necessary.

3.1.3 Chemical Hazard Summary

In general, the volatile and semi-volatile organic compounds can be grouped into a class of chemicals called chlorinated hydrocarbons, which are used in a variety of chemical processes, such as reagents, degreasers and/or solvents. Aromatic hydrocarbons and ketones are the two other major classes of compounds that have been identified on the WRL Site. Short-term, low concentration exposure to many of these compounds may result in no reaction or to slight feelings of dizziness or fatigue. The following is an example of available toxicological information on some of the chemicals that may be brought to exposure during work activities at the WRL Site:

Chlorinated hydrocarbons - These compounds are highly mobile, migrating easily through water, air, and soil. They are persistent in the underground environment, although they may evaporate rapidly when exposed to air and may degrade at the surface under the influence of ultra-violet light. Many members of this group are suspected carcinogens (cancer-causing chemicals).

Chlorinated hydrocarbons may act on the central nervous system, either as a stimulant or depressant. Mild exposure may cause such symptoms as dizziness, nausea, abdominal pain, and vomiting. In chronic (long term) poisoning, loss of weight and appetite may occur. Moderately severe poisoning presents those symptoms given above followed by severe irritability, convulsive seizures, and coma. Several of the members of this group which have been identified on the WRL Site are generally considered as posing a considerable health and safety threat, and are therefore of primary concern. These include the following:

methylene chloride - Odor threshold 150 - 300 ppm. Ionization potential (I.P.) = 11.28. OSHA recommended permissible exposure limit (PEL) = 500 ppm for 8 hour day/40 hour work week; STEL = 500 ppm for 15 minutes. The American Conference of Government Industrial Hygienists (ACGIH) recommends an 8 hour threshold limit value (TLV) = 50 ppm. Although this is one of the least toxic chlorinated hydrocarbons, its low boiling point enhances quick and extensive vaporization, resulting in high concentrations of vapor. Its action is usually narcotic, and at high concentrations can cause liver damage. A level of 2,000 - 10,000 ppm may cause anesthesia in humans. The odor threshold should not be relied upon as an adequate warning of exposure.

vinyl chloride - OSHA PEL = 1.0 ppm. I.P. = 10.00. Odor threshold about 260 ppm. Dizziness and disorientation occur at 25,000 ppm after 3 minutes exposure. Is a flammable gas at room temperature. Symptoms of exposure are similar to mild alcohol intoxication. Short, high level exposure may

cause light headedness, some nausea, and/or dulling of visual and auditory responses. Regarded as a carcinogen to humans.

1,2-Dichloroethane - The OSHA PEL is 50 ppm. ACGIH recommends a TLV of 10 ppm. The OSHA ceiling concentration 100 ppm. I.P. = 11.04. Short-term, high level exposure may result in narcotic and/or anesthetic effect. Atmospheric concentration immediately hazardous to human life is unknown. This chemical is classified as a carcinogen.

Aromatic hydrocarbons - Compounds in this group are highly volatile, moderately soluble, biodegradable, and only slightly adsorbed on soils and sediments. Their presence at the surface is based on volatilization rates and biodegradation activities. In the groundwater environment, they are persistent and mobile. Exposure to these substances is primarily through vapor inhalation, although absorption through the skin may also readily occur. Acute exposure poses the primary health hazard of these substances. Low level exposure may result in irritability, excitability, muscle tremor, and headache. Some of the notable light aromatic compounds which may be present include ethyl benzene, xylene and toluene.

benzene - colorless to pale yellow watery flammable liquid with a gasoline-like odor. I.P. = 9.25. Explosive limits, 1.3% and 7.1% by volume in air. The symptoms of benzene exposure include dizziness, excitation, pallor followed by flushing, weakness, headache, breathlessness, chest constriction. Coma and possible death. Carcinogenic to humans. The OSHA PEL is 1 ppm and STEL is 5 ppm. NIOSH recommends TWA of 1 ppm.

ethyl benzene - colorless, flammable liquid with aromatic odor. I.P. = 8.76. Explosive limits - 1% and 6.7% by volume in air. Toxicity is characterized by irritancy to skin and, to a lesser extent, mucous membranes. The symptoms of ethyl benzene exposure are as follows: 5000 ppm - intolerable irritation; 2000 ppm - immediate and severe eye irritation and lacrimation, moderate nasal irritation; 1000 ppm - irritation and tearing of eyes, tolerance develops rapidly; 200 ppm - moderate and occasional eye irritation. The OSHA PEL is 100 ppm and the OSHA STEL is 125 ppm.

xylene - clear, flammable liquid with aromatic hydrocarbon odor. I.P. = 8.56 Exposure symptoms - headache, fatigue, irritability, nausea, anorexia; chronic exposure may result in injury to heart, liver and/or kidneys. The OSHA PEL is 100 ppm and STEL is 150 ppm. NIOSH recommends TWA of 100 ppm and 10 minute ceiling of 200 ppm.

toluene - The OSHA PEL is 100 ppm with an STEL of 150 ppm. ACGIH recommends a 50 ppm TLV. flammable, refractive, colorless liquid with aromatic hydrocarbon odor. Exposure limits = 1.3% and 7.1% by volume in air. I.P. = 8.82. The symptoms of toluene exposure are as follows: 500 - 1500 ppm - heart palpitation, extreme weakness, loss of coordination; 200 - 500 ppm - impairment of coordination, momentary loss of memory; Less than 200 ppm - headache, lassitude, nausea.

Hydrogen sulfide - Hydrogen sulfide has a rotten-egg odor and is found in association with methane and other landfill gases due to microbial activity in landfills. The threshold limit value (TLV) is 10 ppm, as an 8-hour time-weighted average (TWA), with a short term exposure limit (STEL) of 15 ppm. Hydrogen sulfide affects the respiratory system, lungs and eyes; and causes dizziness, headache; and fatigue. It also produces olfactory fatigue such that high concentrations or a continuous exposure to low concentrations are not detected by odor.

Hydrogen cyanide - Hydrogen cyanide has a bitter almond odor and is potentially present in landfill gases. The TLV-Ceiling (C) is 10 ppm. Hydrogen cyanide is a Class A poison which can cause asphyxiation through injection or inhalation. It can also be absorbed through skin and mucous membranes. Symptoms of exposure include irritation of the throat, palpitation, difficulty breathing, salivation, nausea, headache, weakness of arms and legs, convulsions, and paralysis.

Refer to Table 1 - Analytical Results from Previous Sampling at Site. Chemical hazard summary sheets are included in Appendix A.

The potential for additional hazards of concern at the site include biological hazards, plants, insects, and animals.

- **Biological** - Occupationally induced infection can happen in any occupation as a result of exposure to bacteria, viruses, fungi, or parasites. A simple laceration from the sharp edges of an envelope can become secondarily infected with staphylococci or streptococci. A thorn, a wood splinter, or a metal slug acting as a foreign body can pave the way for secondary infection of the skin. Cuts scrapes or other lacerations should be cleaned, disinfected, and dressed immediately following first aid procedures.
- **Plants** - A broad variety of plants and wood cause injury to the skin thorough primary irritation or allergic sensitization. Although the chemical identity of many of the plant toxins has not been established, it

is well known that the irritant or allergenic agent can be present in the leaves, stems, flowers, bark, and other components of the plant. Examples for this region include, poison ivy and sumac. Personnel will be wearing long pants at the site. If work is to be performed in areas with poison ivy or sumac, contact with the plant should be avoided. Personnel may need to wear gloves or chemical resistant clothing (Tyvek).

- **Insects** - Insect bites and stings can be serious to hyper-sensitive persons and even deadly depending on the type of insect. Examples for this region include bees, wasps, hornets, brown recluse spiders, and ticks. Lyme disease is a tick-borne disease and starts out with flu-like symptoms but may lead to arthritis and serious nerve and heart damage. Avoid tall grassy areas or other areas of thick vegetation. If work is performed in these areas, personnel should wear light colored clothing, tape their pants cuffs around their ankles, use a commercially available repellent and check for ticks regularly.
- **Animals** - Animal bites are a concern because of the potential for the animal to carry the rabies virus, which attacks the nervous system when transmitted through the bite of a rabid animal. If an animal bite occurs the victim must be taken to the nearest medical facility immediately.

EMPLOYEE TRAINING

All covered personnel shall participate in routine health and safety education and training programs. These programs are designed to provide the covered personnel with a thorough knowledge of hazardous materials, health and safety hazard potentials, and to comply with OSHA 29 CFR 1910.120(e) which requires 40 hours initial instruction, eight hours refresher training, an additional eight hours specialized training for supervision. At a minimum, this training includes the following:

- General Health and Safety Rules
- Basics of Toxicology/Physiology
- Hazardous Materials (types/characteristic)
- Respiratory Training/Emergency Procedures
- Chemical Protective Clothing
- Decontamination Procedures
- Fire Prevention/Protection
- First Aid/CPR
- Confined Space Entry Work/Safety
- Atmospheric Testing/Sampling Procedures
- Emergency Response Procedures
- Electrical Hazard
- Federal and State Regulations

In addition to the above referenced training, Warzyn requires these additional topics to be included:

- Basics of Chemistry
- Hazard Communication Program
- Respiratory Selection/Maintenance
- Use of Instrumentation
- Temperature Stress

- Hazard Recognition
- Medical Surveillance
- Levels of Protection
- Action Levels

All Warzyn field staff participate in regularly scheduled health and safety training programs. These programs, directed by the Corporate Health and Safety Manager, are designed to meet the training requirements of 29 CFR 1910.120(e) and other applicable OSHA and U.S. EPA training requirements.

5

PERSONAL PROTECTIVE EQUIPMENT

5.1 PERSONAL PROTECTION LEVELS AND EQUIPMENT

Refer to Appendix H - Respiratory Protection for detailed information on respirator selection, limitations, usage, and maintenance.

LEVEL D

Selection Criteria - This level of protection is to be selected when no respiratory hazards and no dermal hazards are expected to be present. Site conditions are expected to meet all of the following criteria:

- Contaminant levels are less than the lowest threshold-limit value (TLV), either the TLV time-weighted average (TLV-TWA), TLV short-term exposure limit (TLV-STEL), or TLV ceiling (TLV-C).
- No Oil and Hazardous Materials Technical Assistance Data Systems (OHMTADS) Category I or II chemicals are present.

NOTE Level D does not include any disposable personal protective equipment (PPE).

Personal Protective Equipment

Required PPE

- Chemical-resistant boots with safety toe and steel shank
- Work uniform

Optional PPE, use determined by Site conditions

- Hard hat
- Face shield
- Safety glasses with side shields, or splash goggles
- Hearing protection

LEVEL D - MODIFIED

Selection Criteria - This level of protection is to be used when there are no respiratory hazards but the possibility exists of low to moderate dermal hazards. Site conditions meet all of the following criteria:

- Contaminant levels are less than the lowest TLV (TWA, STEL or C).
- No OHMTADS Category I chemicals are present.
- Any OHMTADS Category II chemicals present are at less than the listed concentration.

Personal Protective Equipment

Required PPE

- Chemical-resistant boots with safety toe and steel shank
- Chemical-resistant clothing, polycoated Tyvek
- Chemical-resistant outer gloves, Nitrile or Neoprene

Optional PPE, use determined by Site conditions

- Hard hat
- Face shield
- Safety glasses with side shields, or splash goggles
- Disposable boot covers, Latex
- Hearing protection

- Chemical-resistant inner gloves, Latex
- Cooling vest

LEVEL C

Selection Criteria - If low to moderate respiratory hazards are expected and the dermal hazards are not expected to exceed the low to moderate level, this level of protection can be used provided all of the following criteria are met:

- The use of an air-purifying respirator (APR) is not precluded.*
- Contaminant levels are less than 50 times the lowest TLV (TWA, STEL or C) of any contaminant present.
- No OHMTADS Category I chemicals are present.
- Any OHMTADS Category II chemicals present are at less than the listed concentration.

* An APR can not be used if any of the following conditions are true:

- The oxygen level is less than 19.5%.
- The contaminants present do not have good warning properties.
- The odor/taste threshold of the contaminant is above the TLV.
- The APR manufacturer specifically excludes its use in the presence of the contaminant.
- The wearer has not passed a qualitative fit test within the last twelve months.
- The wearer has not been medically cleared to wear respiratory protection.

Personal Protective Equipment

Required PPE

- Chemical-resistant boots with safety toe and steel shank
- Chemical-resistant clothing, polycoated Tyvek

- Chemical-resistant outer gloves, Nitrile or Neoprene
- Air-purifying respirator with full-facepiece and organic vapor/acid gas/HEPA-combination cartridges

Optional PPE, use determined by Site conditions

- Hard hat
- Face shield
- Chemical-resistant inner gloves, Latex
- Disposable boot covers, Latex
- Hearing protection
- Cooling vest
- Emergency escape mask
- Two-way radio

LEVEL B

Selection Criteria - When moderate to high respiratory hazards are expected or the use of an APR is precluded, but the dermal hazards are considered low to moderate dermal, this level of protection is to be selected.

- Moderate to high respiratory hazards are defined as contaminant levels greater than or equal to 50 times the lowest TLV (TWA, STEL, or C) of any contaminant present.
- A low to moderate dermal hazard means that no OHMTADS Category I chemicals are present and any OHMTADS Category II chemicals present are at less than the listed concentration.

Personal Protective Equipment

Required PPE

- Chemical-resistant boots with safety toe and steel shank
- Chemical-resistant clothing, polycoated Tyvek or Saranex

- Chemical-resistant inner gloves, Silver Shield
- Chemical-resistant outer gloves, Neoprene or Nitrile
- Positive-pressure/pressure-demand self-contained breathing apparatus (SCBA), or airline respirator

Optional PPE, use determined by Site conditions

- Hard hat
- Face shield
- Disposable boot covers
- Hearing protection
- Cooling vest
- Emergency escape mask
- Two-way radio

5.2 TASK SPECIFIC LEVELS OF PROTECTION

<u>Task</u>	<u>Entry LOP</u>	<u>Upgrade LOP</u>
• Water Levels/ Groundwater Sampling	D Modified	C
• Well Installation/ Soil Borings	D Modified	C or B
• Pump Test	D Modified	C

6

MEDICAL SURVEILLANCE

All covered personnel working at the WRL Site will participate in a health surveillance program under the direction of an Occupational Physician. Warzyn's surveillance program consists of the following elements:

- History Questionnaire - Baseline
- History Questionnaire - Periodic
- Physical with Neurological
- Chest X-ray (PA)
- Electrocardiogram
- Pulmonary Function Testing
- Audiometric Testing
- Vision Testing
- Stool Occult Blood
- Blood Chemistry Profile
- Hematology Profile (CBD)
- Urinalysis
- Lyme Disease
- Blood Lead Levels
- Urine Heavy Metals
 - lead, arsenic, mercury, cadmium
- RBC Cholinesterase
- Serum PCB Level
- Reticulocyte Count
- Carboxyhemoglobin

A pulmonary function study will be performed on each employee to determine if he/she is physically able to perform work while using respiratory protective equipment in compliance with 29 CFR Part 1910.134 and ANSI Z88.2 - 1980.

Good personal hygiene standards must be maintained and areas of shelter will be provided during periods of bad weather. Heat stress and cold stress precautions will be taken. Refer to Appendix C Temperature Stress. A First Aid Kit recommended by Warzyn's medical advisor, meeting OSHA requirements (Subpart D, Section 1926.50 and ANSI Z208.1 - 1978), will be available in a support vehicle, in the RD/RA Office, the Winnebago Reclamation Scale House, and the NRG Technologies office during the work.

This project does not require medical surveillance or biological monitoring procedures beyond the provisions of the routine pre-employment and annual medical surveillance program. Current medical testing includes blood tests for organ function, including liver function, as appropriate for the anticipated materials.

Employees of Warzyn are informed that their medical records are retained by the medical advisor and that they can obtain copies of these records by written request to the medical advisor. Additionally, a copy of all test and examination results are provided by the medical advisor directly to the employee after each examination.

The employee's final assessment received by Warzyn from the medical advisor notes any necessary temporary or permanent work restrictions, the employee's ability to wear respiratory protection while working, and any recommended follow-up testing.

AIR MONITORING

7.1 AIR MONITORING STRATEGY FOR SPECIFIC CONTAMINANTS

Air monitoring is to be performed to ensure that the appropriate engineering controls and personal protective equipment are adequate for the job task being performed and to ensure that permissible exposure limits (PEL) are not exceeded.

AIR MONITORING PLAN

Upon initial entry or the beginning of a work task, air monitoring will be conducted to determine the presence of immediately dangerous to life or health (IDLH) conditions. These include:

- Oxygen <19.5 or >23.5%
- LEL >10%
- Compounds above the IDLH level

Air monitoring should be performed in the following locations:

- Upwind of work areas to establish background air contaminants (wind direction indicators will be installed)
- In support zone to check for contamination
- Along the decontamination line to check that workers are not removing PPE in contaminated area.
- Exclusion zone to verify levels of protection and boundaries

- Downwind to track contaminants leaving the site.

Air monitoring should be performed whenever any of the following situations arise:

- Work begins at different portions of the site
- New contaminants are noted
- A new/different phase of work is started
- Work is being performed in areas with obvious liquid contamination
- Intrusive activities

Conduct monitoring of the person collecting samples. If samples are being collected in jars, use monitoring equipment to determine the level of contaminants in the breathing zone of the person collecting the samples. Air monitoring should be performed on personnel with the highest potential exposure. Monitoring should also be performed at the source of chemical hazards such as at boreholes and at the surface of contaminated materials.

Air monitoring for the RD/RA activities will utilize the following:

OXYGEN

A direct reading oxygen meter will be used to determine the percent of oxygen in the atmosphere. A direct reading oxygen meter is state-of-the-art equipment for determining the percent of oxygen in the atmosphere.

Instrument Reading

Action to be Taken

<19.5% or >23.5%

Cease operations and move to safe area. Re-evaluate work plan. Engineering controls such as forced ventilation and use of non-sparking tools are to be implemented if operations are to continue. **DO NOT CONTINUE WORKING UNTIL OXYGEN LEVELS ARE BETWEEN 19.5% AND 23.5%.** When oxygen levels are outside this range, combustible gas meter readings are not reliable.

COMBUSTIBLE GASES

Action levels are based on the readings of a combustible gas meter. The readings are generally given as a percentage of the lower explosion limit (% LEL). The %LEL's stated below are not to be used for confined space entry positions.

<u>Instrument Reading</u>	<u>Action to be Taken</u>
0 to 5% LEL	Continue working and monitoring atmosphere for combustible gases. Inform personnel working in area whenever readings > 5% LEL.
5 to 10% LEL	Continue working with caution. Inform personnel working in area of readings. Be prepared to cease operations.
>10% LEL	Cease operations and move to safe area. Re-evaluate work plan. Engineering controls such as forced ventilation and use of non-sparking tools are to be implemented if operations are to continue. DO NOT CONTINUE WORKING UNTIL CONDITIONS ARE CONSISTENTLY BELOW 10% LEL.

NOTE: When oxygen levels are above 23.5% or below 19.5%, combustible gas meter readings are not reliable. Gas standard calibration check is hydrogen sulfide, hydrogen cyanide, nitrogen and natural gas.

HYDROGEN SULFIDE (HS)

A direct reading HS meter will be used to determine HS levels. Whenever the alarm sounds on the HS meter, cease work immediately and contact the SSO or HSM. For HS the TLV is 10 PPM, and the alarm is set for 10 PPM.

If approval is given by the SSO or HSM, verification of the presence of HS is to be made using colorimetric tubes which can detect HS. The person taking the sample is to wear appropriate respiratory protection. There is no air-purifying cartridge approved for use in a atmosphere containing HS. A supplied-air respirator must be used.

If the presence of HS is confirmed, cease activities and contact the HSM. If the colorimetric tubes do not indicate the presence of HS, continue with site activities cautiously and continue to monitor for HS with the direct reading meter.

The combination of a direct reading HS meter and confirmation with colorimetric tubes is an acceptable practice for determining the presence of HS levels.

HYDROGEN CYANIDE (HCN)

A direct reading HCN meter will be used to determine HCN levels. Whenever there is any positive reading on the HCN meter, cease work immediately and contact the Site Safety Officer (SSO) or Health and Safety Manager (HSM). The ceiling for HCN is 10 PPM, and the alarm is set for 10 PPM.

If approval is given by the SSO or HSM, verification of the presence of HCN is to be made using colorimetric tubes which can detect HCN. The person taking the sample is to wear appropriate respiratory protection. There is no air-purifying cartridge approved for use in an atmosphere containing HCN. A supplied-air respiratory must be used.

If the presence of HCN is confirmed, cease activities and contact the HSM. If the colorimetric tubes do not indicate the presence of HCN, continue with site activities cautiously and continue to monitor for HCN with the direct reading meter.

The combination of a direct reading HCN meter and confirmation with colorimetric tubes is an acceptable practice for determining the presence of HCN levels.

VINYL CHLORIDE

Whenever any reading above background is noted with the organic vapor monitor, colorimetric tubes will be used to verify the presence of vinyl chloride. If vinyl chloride is found to be present above 1 ppm, personnel will cease operations and contact the Health and Safety Manager. There is no air-purifying cartridge approved for use in an atmosphere containing vinyl chloride. A supplied-air respirator must be used.

The combination of an organic vapor monitor and confirmation with colorimetric tubes is an acceptable practice for determining the presence of vinyl chloride levels.

VOLATILE ORGANIC COMPOUNDS (VOCS)

Equipment:

Photoionization meter with a lamp rating of at least 11.7 eV

Action Levels:

\leq background Level D or D-Modified

< 5 Instrument Units above background: Level C

5 to 500 Instrument Units above background: Level B

≥ 500 Instrument Units above background: Cease operations and move to a safe area. Contact the Health and Safety Manager and re-evaluate the work plan.

Refer to Appendix K - WRL's Site Sample Air Monitoring Logs to be used by site personnel daily.

NOTE: During the Remedial Investigation, it was determined that potential radiation exposure was not a concern at the site. Therefore, air monitoring or sampling will not be required unless circumstances change which would warrant monitoring or sampling.

7.2 FIELD CALIBRATION

Field calibration is generally performed at least at the beginning and end of each work shift. Field calibration procedures are detailed in the Instrument Operating Procedures Manual and generally follow the instrument manufacturer's guidelines. Also refer to Appendix J - WRL's Site Calibration Schedule and Procedures for Air Monitoring Equipment.

All preventive maintenance for instrumentation will be performed in accordance with the manufacturer's operation manuals.

8

SITE BOUNDARIES AND ENTRANCE/EXIT

8.1 SITE AND PROJECT BOUNDARIES

WRL Site evacuation routes are shown in Figure 2.

8.2 PRESENT SITE SECURITY

Access to the WRL Site is restricted by a main gate and gatehouse and a chain link fence extending from the access road westward approximately 1,200 feet and eastward around the east end of the landfill adjacent to Lindenwood Road for approximately 2,500 feet. Access to the WRL Site beyond the extent of the chain link fence is limited by topography (steep slopes and a heavily wooded area) along the southwest quarter and western side of the landfill, and a three-strand barbed wire fence along the northwestern and southeastern portions of the WRL Site.

8.3 ZONES OF CONTAMINATION

Zone boundaries do not need to be marked. Generally, the area within 20 feet of the location of field operations is considered the Exclusion Zone (EZ). Access from the Support Zone (SZ) to the EZ is to be through the Contamination Reduction Zone (CRZ). The location of the CRZ needs to be determined daily at the WRL Site. The location and type of the day's field operations, together with atmospheric conditions (i.e., wind direction), are to be used to locate the CRZ and SZ so that they are upwind from field operations.

Wind direction indicators (ribboned stakes) will be installed around the site to enable workers and/or emergency personnel to determine wind direction.

Temporary decontamination facilities will be constructed in an area removed from the areas of active operations. Plastic sheeting will be placed on the ground to

catch soil and contaminated solutions. The temporary decontamination station will contain curbing and possibly a catch basin (e.g., half drum sunk into the ground). The decontamination rinse water will be pumped from the catch basin into 55-gallon drums for storage and eventual disposal in the leachate collection system.

8.4 ENTRY RESTRICTIONS

After regular hours of operation, the main gate is monitored by video camera by the operator at the sludge drying plant to allow for sewage sludge delivery 24 hours a day. The scale is equipped with an alarm to alert the operator of entrance through the gate. Another chain link fence gate is located in the southeastern portion of the landfill just off of Lindenwood Road. This gate is not monitored, but is chained and padlocked. The WRL Site is planning to electronically monitor this gate in the near future.

8.5 ENTRANCE TO BE USED

A Remedial Design/Remedial Action Office (RD/RA Office) will be established at the WRL Site which will be clearly identified by appropriate signs. A separate entrance to the WRL Site will be established for the exclusive use of the RD/RA covered employees.

8.6 CHECK-IN REQUIRED

All personnel entering or leaving the WRL Site must register with the guard located at RD/RA entrance to the Site.

8.7 WORK HOURS

Dawn to dusk

8.8 WORK DAYS

Monday through Friday

GENERAL SITE HEALTH AND SAFETY CONSIDERATIONS

9.1 WEATHER CONDITION RESTRICTIONS

The Site Safety Officer (SSO) has the authority, should severe weather threaten, to place RD/RA activities at the WRL Site on standby, cease operations, and/or evacuate as deemed necessary.

Weather conditions at the WRL Site can not be controlled. Covered personnel are to be aware of the warnings of impending severe weather and the precautions that are to be taken when severe weather threatens. Refer to the SOP for Severe Weather found in Appendix B.

9.2 TEMPERATURE STRESS

Hot or cold weather is generally a consideration at any site and can not be controlled. Covered personnel need to be aware of engineering controls which can reduce temperature stress, the signs and symptoms of temperatures stress, and first aid measures for victims of temperature stress. Refer to the SOP for Temperature Stress found in Appendix C.

9.3 GENERAL SITE HEALTH AND SAFETY RULES

Some general safe work practices apply to all sites. Refer to the SOP for General Site Health and Safety Rules found in Appendix D.

9.4 PHYSICAL HAZARDS

Heavy equipment will be present and may impair hearing, agility, or vision.

9.5 NOISE

Hearing protection is required when working in close proximity to heavy equipment, the level of noise interferes with communications, or the sound level exceeds 85 dB. Generally, if you can not hear someone speaking at a normal conversational level when they are three feet from you, you need hearing protection.

9.6 CONFINED SPACES

Confined space entry is not allowed in the scope of this HASP. Should a confined space entry situation be encountered, contact the Health and Safety Manager and re-evaluate the work plan. Confined space entry is not expected and confined space entry is not part of the Groundwater RD Work Plan. If a confined space such as a tunnel, cavern, pipe or similar space is discovered, DO NOT ENTER IT; call the Site Safety Officer. Do not open the space (if sealed) to do air monitoring until the Site Safety Officer has been contacted, the potential hazards within the confined space are investigated, and a written confined space entry plan has been distributed to all workers.

9.7 UTILITIES

Utilities will be cleared prior to intrusive activities commencing.

9.8 DAILY INSPECTIONS AND MEETINGS

The SSO will perform daily safety inspections and meetings so that safety related items as noted below are in good condition and safety provisions are implemented.

- PPE - correct type, quantity and condition
- Respiratory protection equipment
- Air monitoring instrumentation and equipment
- First Aid supplies location and condition
- Eyewash location and condition

- Emergency Route map and telephone numbers are posted
- Tools and other equipment

In addition to routine inspections, the SSO will hold daily site safety briefings to discuss safety considerations for the day's operations. These meetings should include:

- Chemical concerns
- Locations of work crews in relation to physical hazards, such as utilities, ditches, excavations, and heavy equipment
- Weather consideration for day including pending severe weather, and potential heat stress issues
- Main points of the safety plan in context with the day's work tasks

See Appendix N for the daily safety checklist.

9.9 BUDDY SYSTEM

Use of the "Buddy System" is required during site operations.

INVESTIGATION DERIVED MATERIALS DISPOSAL

Spills are most likely to occur during loading or hauling of contaminated soil, leachate, or groundwater. Any spill occurring on final cover or on areas of the site not to be part of the final cover will be cleaned up and appropriately disposed. Chemicals will not be brought to the site, other than small (1 liter or less) containers for decontamination activities; a spill of which would be easily controlled by the employees engaged in the activity. Materials for spill containment and cleanup such as absorbents, visquine, and machinery (for excavation, loading, and diking) will be available on site.

Use the appropriate disposal method for each material as noted below:

- **Dispose** of the material in the designated waste receptacle on site
- **Drum** and label the material and leave it on site
- **Bag** and label the material and leave it on site

Material**Method of Disposal**

Clothing

drum and dispose within the landfill

Disposable equipment

drum and dispose within the landfill

Drilling cuttings

drum and dispose within the landfill

Monitoring well development and purge water

dispose in the leachate collection system*

Decontamination water and solutions

dispose in the leachate collection system*

Note: Refer to Warzyn's Appendix E-Decontamination for further details.

- * Only minor amounts of liquid will be disposed in the leachate collection system. The limited volume to be disposed will not adversely affect operation of the leachate collection system.

EMERGENCY INFORMATION

In case of emergency response, contact the proper authority(s) at the following numbers:

Ambulance	911
Fire and Police Emergency	911
Poison Control	(800) 543-2022
IEMA	(800) 782-7860
IEPA Emergency Response Unit	(217) 782-3637 or (800) 782-7860
Winnebago County Sheriff	911
St. Anthony Hospital	(815) 226-6000
Winnebago ESDA	(815) 877-5990

	<u>Address</u>	<u>Telephone</u>	<u>Contact Person</u>
Client	8402 Lindenwood Road Rockford, Illinois	(815) 874-4806	Tom Hilbert
Utilities	JULIE	800/892-0123	
Spill response	Hazardous Waste Hotline National Response Center CHEMTREC	800/621-3191 800/424-8802 800/424-9300	
RD/RA Office	8402 Lindenwood Road Rockford, Illinois		

<u>Emergency Contacts</u>	<u>Name</u>	<u>Business Phone</u>
Warzyn Medical Advisor	Dr. Shirley A. Conibear	312/782-4486
U.S. EPA RPM	Mr. Bernie Schorle	312/886-4746
IEPA Project Manager	Mr. Fred Nika	217/524-4826
U.S. EPA Emergency Response Branch	Robert Bowden	312/353-2318

The Sheriff's Department, Fire Department, EPA, and St. Anthony Hospital have all been notified about site operations and the potential for emergency response.

Upon arrival of the appropriate emergency response personnel, the site health and safety coordinator shall defer all authority but shall remain on the scene if necessary to provide any and all possible assistance. At the earliest opportunity, the Site Health and Safety Coordinator shall contact the Project Manager or coordinator shall contact the Project Manager or Health and Safety Officer.

Warzyn Personnel

Project Manager:	Al Schmidt	Phone	(w) 708/691-5115 (h) 708/462-2568
Pre-Design:	Al Schmidt	Phone	(w) 708/691-5115 (h) 708/462-2568
Health & Safety Manager:	Erik A. Goplin	Phone	(w) 608/231-4747 (h) 608/437-4879

The local fire department will be notified concerning site operations, potential site contamination, and emergency response. The phone number of the New Milford Fire Department is (815) 874-2456 (non-emergency) 911 (emergency).

In the event of a fire or explosion, if the situation can be readily controlled with available resources without jeopardizing the health and safety of yourself, the public, or other site personnel, take immediate action to do so, otherwise:

- (1) Notify emergency personnel by calling 911 .
- (2) If possible, isolate the fire to prevent spreading.
- (3) Evacuate the area.

11.1 ON-SITE MEDICAL INJURY OR ILLNESS

In the event of an injury requiring more than minor first aid, or any employee reporting any sign or symptom of exposure to hazardous substances, immediately take the victim to St. Anthony Hospital located at 5658 East State Street in Rockford, Illinois, Phone 815/226-6000. Refer to Figure 3 for written directions and a site map to St. Anthony Hospital. All Warzyn staff assigned to conduct field work at the WRL Site must drive the emergency route prior to site activities commencing.

Any person who becomes ill or injured in the exclusion zone must be decontaminated as well as possible. Giving consideration as to what risks will be greater, the spread of contamination or physical injury, decontamination should be completed prior to transport. If the patient's condition is serious, at least partial decontamination should be completed.

Anyone being transported to a clinic or hospital for treatment should take with them information on the chemical(s) they have been exposed to at the site. See Appendix A for Chemical Hazard Summary Sheets. Medical history information can be obtained through Riverside Medical Clinic, (815) 633-4300, at the employee's request or the request of the employee's designated representative. The information on potential site contaminants is included in the Site Safety Plan. If the patient is not able to speak, someone familiar with site operations should follow him/her to the hospital.

Winnebago Reclamation will notify the Ambulance service whether the victim has been decontaminated or not prior to transport to the hospital.

Winnebago Reclamation has confirmed that St. Anthony Hospital will accept a contaminated victim.

Designated Personnel Current in First Aid/CPR (Names)

_____	_____
_____	_____
_____	_____

11.2 EMERGENCY ROUTES

Refer to Figure 3 for a map showing the route to the hospital/clinic.

Driving Directions

Go north on Lindenwood Road. Turn right onto Baxter Road (heading east). Turn left on Mulford Road (heading north); Mulford makes a short jog west at Blackhawk Road. Turn left onto Blackhawk Road (heading west). Turn right onto Mulford Road (heading north). Turn left onto State Street (heading west). St. Anthony hospital is on the north side of State Street. Address: 5658 East State Street.

NOTE: Emergency route is to be driven by all site personnel prior to work commencing.

11.3 EMERGENCY PROCEDURES

This section is to be posted at prominent locations on-Site.

On-Site Communications Emergency Channel 2.

On-Site Telephones located in the trailer in the support zone, in the NRG Technologies building, in the Winnebago Reclamation Service scale house, and in the designated support vehicles on-Site.

Emergency Decontamination

Refer to the SOP for Emergency Decontamination found in Appendix E.

Site Evacuation

On-Site operating and emergency communications will be conducted through two-way radios in vehicles, portable radios on foot, and hand signals in case of communication breakdown. A review of hand signals will be conducted during the pre-entry briefing. Refer to WRL's Site Appendix I-Chart of Hand Signals.

All personnel on site will be informed of emergency evacuation procedures and signals. Refer to Figure 2 for map of the evacuation route.

In case of emergency response situations, notify proper authorities. Telephones will be located in the RD/RA Office, designated support vehicles, the Winnebago Reclamation Scale House and the NRG Technologies building located on-Site. Emergency telephone numbers will be posted next to the telephones.

First Aid

It is Warzyn's policy that all field employees maintain current certification in first aid and cardiopulmonary resuscitation (CPR).

The following emergency equipment shall be maintained at the site of active operations, at the perimeter of the exclusion zone (within 100 feet of 10 second access time).

- Fire Extinguisher
- Eye Wash
- First-Aid Kit
- 5 Gallons of Fresh Water (for flushing of skin, general washing)

First Aid Kits. First Aid Kits approved by Warzyn's medical consultant will be on-site near the site of active operations. First Aid Kits include:

- Sterile gauze
- Individual bandaids
- 3" to 4" Ace wraps
- Tape
- Tweezers
- Bandage scissors
- Non-sterile gauze
- Hydrogen peroxide
- Snake bite kit
- Inflatable splint
- Eyesaline
- Mylar blanket
- Cold packs
- Hot packs
- Aspirin/Tylenol
- CPR-mouth shields
- Disposable gloves
- Goggles
- Disposable garment
- Face mask

First Aid kits are to be available on Site in the Warzyn field vehicle. The contents of these kits have been reviewed by Warzyn's medical advisor, as required by 29CFR 1910.151(b) and determined to be appropriate for the number of employees and type of work generally performed by Warzyn.

Refer to the SOP for First Aid found in Appendix G for general first aid procedures.

The supervisors of all sub-contractors are to sign below, indicating that they have read this HASP, understand its contents, and have been given opportunity to discuss its contents with the Site Safety Officer (SSO).

[illegible]

<u>Date</u>	<u>Name</u>	<u>Employer</u>	<u>Signature</u>

It is the responsibility of the Site Safety Officer (SSO) to have a completed and signed copy of this HASP returned to the Health and Safety Coordinator for inclusion in the project file.

JLB/njt/GEP/AJS
[chi 652 78]
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TABLE 1
Analytical Results from
Previous Sampling at Site
Winnebago Reclamation Landfill

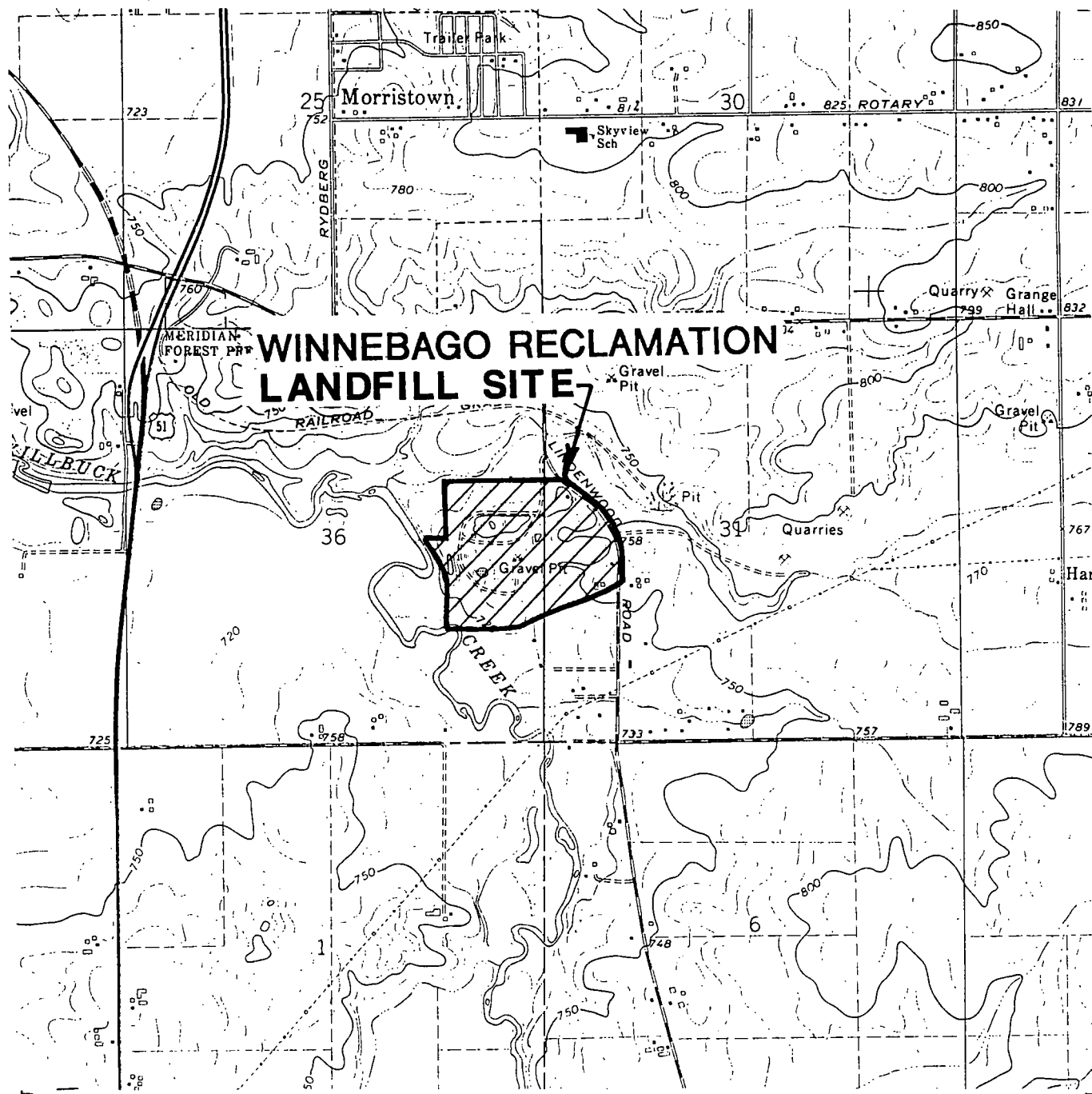
<u>Matrix</u>	<u>Compound</u>	<u>Maximum Concentration</u>	<u>Location</u>	<u>OHMTADS Category</u>
Leachate	Arsenic	318.00 ppb	Leachate Wells	1
Leachate	Barium	4,710.00 ppb	Leachate Wells	2
Leachate	Chromium, Total	933.00 ppb	Leachate Wells	NA
Leachate	Lead	1,450.00 ppb	Leachate Wells	NA
Leachate	Cyanide, Total	6,000.00 ppb	Leachate Wells	NA
Leachate	AROCLOR-1242	6.90 ppb	Leachate Wells	NA
Leachate	2,4-Dimethylphenol	310.00 ppb	Leachate Wells	NA
Leachate	Naphthalene	50.00 ppb	Leachate Wells	2
Leachate	Phenanthrene	53.00 ppb	Leachate Wells	NA
Leachate	bis(2-Ethylhexyl)phthalate	1,200.00 ppb	Leachate Wells	NA
Leachate	Vinyl Chloride	270.00 ppb	Leachate Wells	1
Leachate	Methylene Chloride	100.00 ppb	Leachate Wells	2
Leachate	Acetone	18,000.00 ppb	Leachate Wells	2
Leachate	Total 1,2,-Dichloroethene	2,100.00 ppb	Leachate Wells	NA
Leachate	2-Butanone	22,000.00 ppb	Leachate Wells	2
Leachate	4-Methyl-2-Pentanone	1,600.00 ppb	Leachate Wells	NA
Leachate	Toluene	730.00 ppb	Leachate Wells	2
Leachate	Ethylbenzene	77.00 ppb	Leachate Wells	2
Leachate	Total Xylenes	300.00 ppb	Leachate Wells	NA
Leachate	m and p-Xylene	103.00 ppb	Leachate Wells	NA
Leachate	o-Xylene	62.00 ppb	Leachate Wells	NA
Surface Water	Barium	100.00 ppb	Killbuck Creek	2
Surface Water	Cyanide, Total	17.00 ppb	Killbuck Creek	NA
Surface Water	Methylene Chloride	19.10 ppb	Killbuck Creek	2
Surface Water	1,1,1-Trichloroethane	0.70 ppb	Killbuck Creek	NA
Surface Water	Benzene	1.74 ppb	Killbuck Creek	1
Groundwater	Arsenic	46.00 ppb	Monitoring Wells	1
Groundwater	Barium	1145.00 ppb	Monitoring Wells	2
Groundwater	Lead	37.00 ppb	Monitoring Wells	NA
Groundwater	Cyanide, Total	494.00 ppb	Monitoring Wells	NA
Groundwater	Vinyl Chloride	98.00 ppb	Monitoring Wells	1
Groundwater	Chloroethane	150.00 ppb	Monitoring Wells	NA
Groundwater	1,1-Dichloroethane	110.00 ppb	Monitoring Wells	NA
Groundwater	Total 1,2-Dichloroethene	160.00 ppb	Monitoring Wells	NA
Groundwater	1,2-Dichloroethane	4.10 ppb	Monitoring Wells	NA
Groundwater	1,1,1-Trichloroethane	37.00 ppb	Monitoring Wells	NA
Groundwater	1,2-Dichloropropane	11.00 ppb	Monitoring Wells	NA

<u>Matrix</u>	<u>Compound</u>	<u>Maximum Concentration</u>	<u>Location</u>	<u>OHMTADS Category</u>
Groundwater	Trichloroethene	160.00 ppb	Monitoring Wells	NA
Groundwater	Benzene	17.00 ppb	Monitoring Wells	1
Groundwater	Tetrachloroethene	75.00 ppb	Monitoring Wells	NA
Groundwater	Chlorobenzene	8.30 ppb	Monitoring Wells	2
Groundwater	Ethylbenzene	9.00 ppb	Monitoring Wells	2
Groundwater	trans-1,2-Dichloroethene	6.50 ppb	Monitoring Wells	NA
Groundwater	cis-1,2-Dichloroethene	280.00 ppb	Monitoring Wells	NA
Groundwater	1,4-Dichlorobenzene	63.00 ppb	Monitoring Wells	NA

NOTES:

ppb = parts per billion
OHMTADS = Oil and Hazardous Materials Technical Assistance Data System.





NOTES

1. BASE MAP DEVELOPED FROM THE ROCKFORD SOUTH, ILLINOIS 7.5 MINUTE USGS TOPOGRAPHIC QUADRANGLE MAP DATED 1971, PHOTOREVISED 1976.

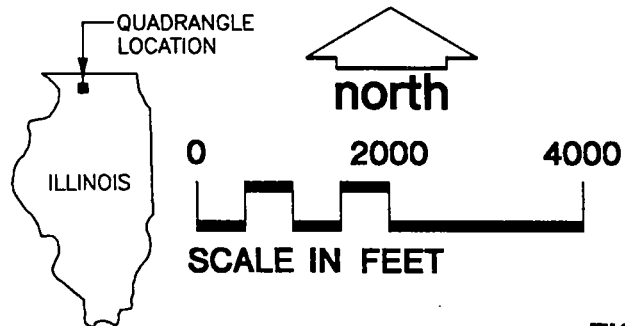


FIGURE 1

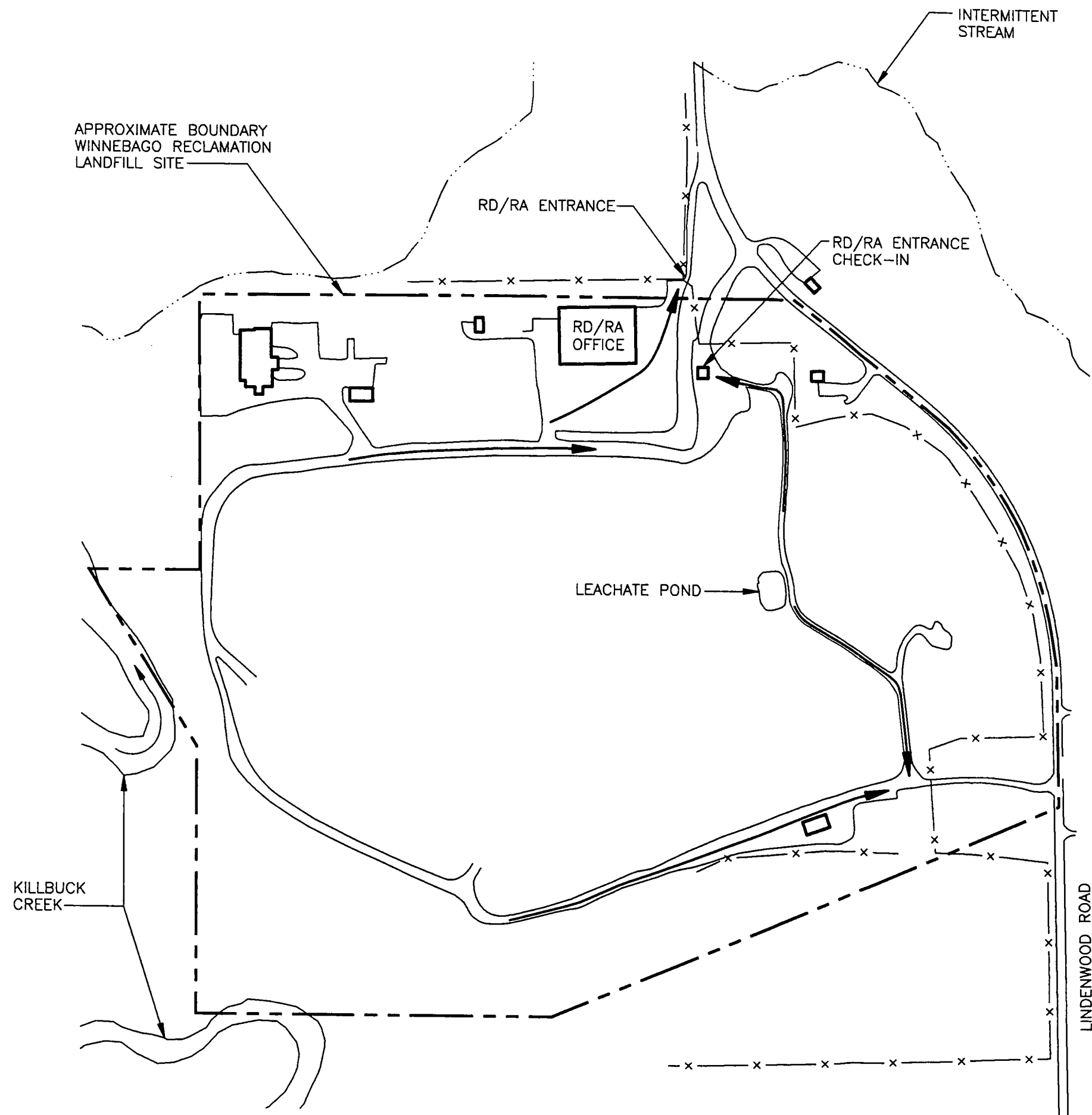
Developed By: CWB Drawn By: ELR
 Approved By: *Gary E. Parker* Date: 2/10/93
 Reference:
 Revisions:

SITE LOCATION MAP

RD/RA HEALTH AND SAFETY PLAN
 WINNEBAGO RECLAMATION LANDFILL SITE
 WINNEBAGO COUNTY, ILLINOIS

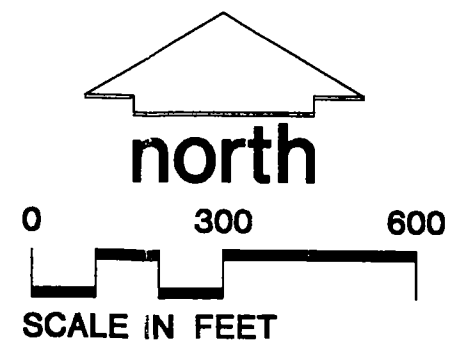
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LEGEND

- x — FENCE
- EVACUATION ROUTE



SITE FEATURES MAP AND EVACUATION MAP

RD/RA HEALTH AND SAFETY PLAN
WINNEBAGO RECLAMATION LANDFILL SITE
WINNEBAGO COUNTY, ILLINOIS

Drawing Number
10009711 **B4**

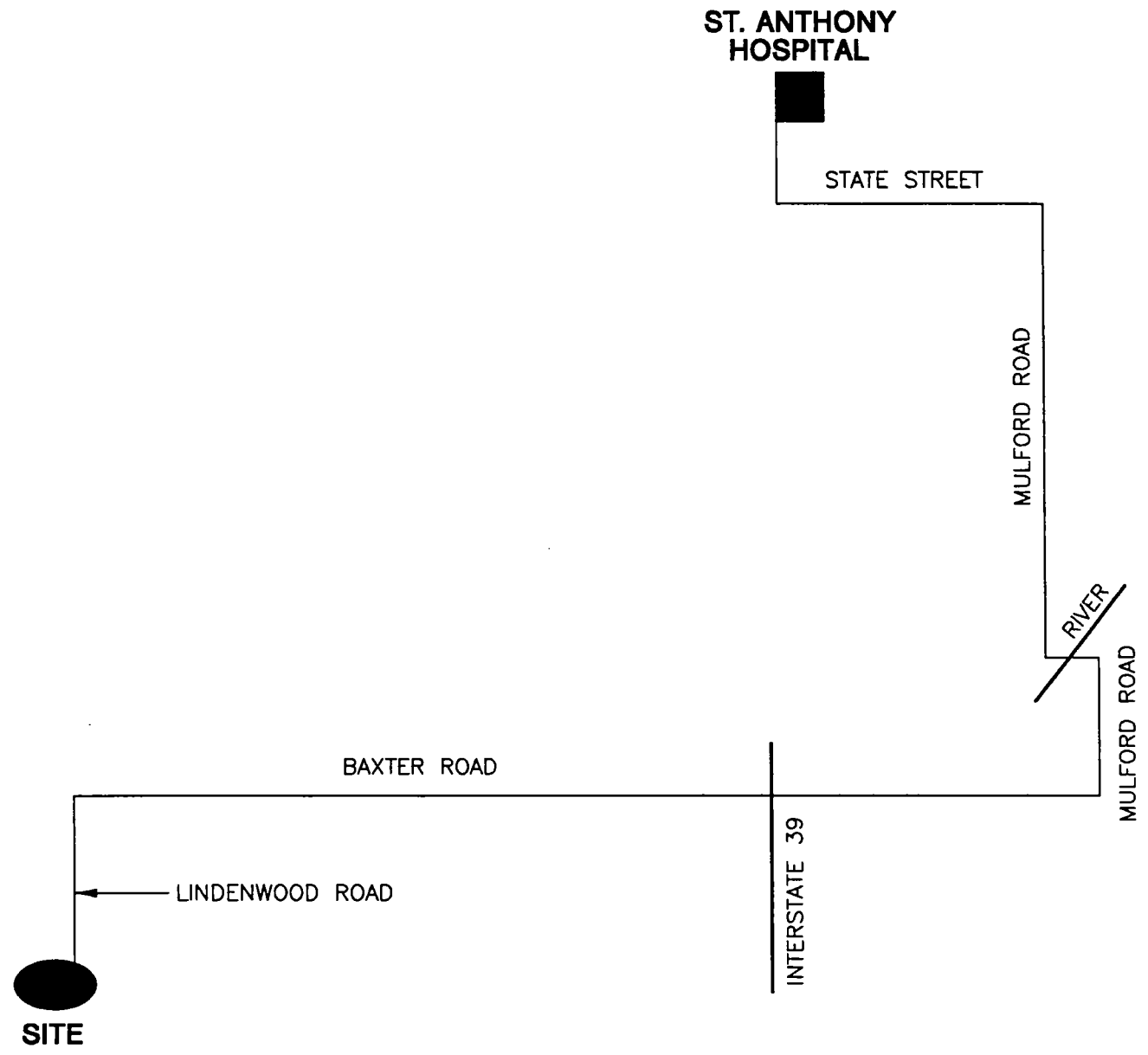


Developed By: CWB
Approved By: *Gary E. Parker* Date: 2/10/93
Reference:
Revisions:

Drawn By: ELR

FIGURE 2

Management Review	Other
Technical Review	Project Manager
Graphic Standards	Lead Professional
QUALITY CONTROL	



- THE SITE IS DIRECTLY OFF OF LINDENWOOD RD.
- 1) GO NORTH ON LINDENWOOD RD.
 - 2) TURN RIGHT ON BAXTER RD. (HEADING EAST)
 - 3) TURN LEFT ONTO MULFORD RD. (HEADING NORTH); MULFORD MAKES A SHORT JOG WEST AT BLACKHAWK RD.
 - 4) TURN LEFT ONTO BLACKHAWK RD. (HEADING WEST)
 - 5) TURN RIGHT ONTO MULFORD RD. (HEADING NORTH)
 - 6) TURN LEFT ONTO STATE ST. (HEADING WEST)
 - 7) ST. ANTHONY HOSPITAL IS ON THE NORTH SIDE OF STATE ST. ADDRESS: 5658 E. STATE STREET.


NOTES

1. EMERGENCY ROUTE IS TO BE DRIVEN BY ALL SITE PERSONNEL PRIOR TO WORK COMMENCING.


north
NOT TO SCALE

FIGURE 3

WARZYN INC.

Developed By: JLB	Drawn By: ELR	EMERGENCY ROUTE MAP RD/RA HEALTH AND SAFETY PLAN WINNEBAGO RECLAMATION LANDFILL SITE WINNEBAGO COUNTY, ILLINOIS	Drawing Number
Approved By: <i>Dan E. Parker</i>	Date: 2/10/93		10009711 A4
Reference:			
Revisions:			



A

CHEMICAL HAZARD
SUMMARY INFORMATION

ACETONE

CHEMTOX DATA

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----- IDENTIFIERS -----

CHEMTOX RECORD 445

LAST UPDATE OF THIS RECORD: 06/03/93

NAME: ACETONE
SYNONYMS: ACETON (German, Dutch, Polish); ACETONE ;
DIMETHYLFORMEHYDE; DIMETHYLKETAL; DIMETHYL KETONE; KETONE,
DIMETHYL; KETONE PROPANE; beta-KETOPROPANE; METHYL KETONE;
PROPANONE; 2-PROPANONE; PYROACETIC ACID; PYROACETIC ETHER;
DIMETHYLFORMALDEHYDE
CAS: 67-64-1 RTECS: AL3150000
FORMULA: C3H6O MOL WT: 58.08
WLN: 1V1
CHEMICAL CLASS: Ketone

See other identifiers listed below under Regulations.

----- PROPERTIES -----

PHYSICAL DESCRIPTION: colorless liquid with a fragrant, mint-like odor

BOILING POINT: 329.27 K 56.1 C 133 F

MELTING POINT: 178.9 K -94.3 C -137.7 F

FLASH POINT: 256.1 K -17.05 C 1.3 F

AUTO IGNITION: 738 K 464.8 C 1360.4 F

CRITICAL TEMP: 508 K 234.85 C 454.73 F

CRITICAL PRESS: 4.70 kN/M2 46.3 atm 680 psia

HEAT OF VAP: 220 Btu/lb 122.18 cal/g 5.112x E5 J/kg

HEAT OF COMB: -12250 Btu/lb -6810 cal/g -285x E5 J/kg

VAPOR PRESSURE: 196 mm @ 21 C

UEL: 12.8 %

LEL: 2.6 %

IONIZATION POTENTIAL (eV): 6.87 TO 7.19

VAPOR DENSITY: 2 (air=1)

EVAPORATION RATE: 6.06(n-BUTYL ACETATE=1)

SPECIFIC GRAVITY: 0.791 @ 20 C

DENSITY: 0.791

WATER SOLUBILITY: MISCIBLE

INCOMPATIBILITIES: ox, acids

REACTIVITY WITH WATER: No reaction

REACTIVITY WITH COMMON MATERIALS: No data

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible
unburned vapors

ODOR DETECTED AT (ppm): 100 ppm

ODOR DESCRIPTION: residual; ketonic, pleasant,
non-residual Source: CHRIS

100 % ODOR DETECTION:

300 ppm

----- REGULATIONS -----

DOT hazard class: 3 FLAMMABLE LIQUID
DOT guide: 26
Identification number: UN1090
DOT shipping name: Acetone
Packing group: II
Label(s) required: FLAMMABLE LIQUID
Special provisions: T8
Packaging exceptions: 173.150
Non bulk packaging: 173.202
Bulk packaging: 173.242
Quantity limitations-
Passenger air/rail: 5 L
Cargo aircraft only: 60 L
Vessel stowage: B
Other stowage provisions:

STCC NUMBER: 4908105

CLEAN WATER ACT Sect.307:No

CLEAN WATER ACT Sect.311:No

CLEAN AIR ACT: Not listed

EPA WASTE NUMBER: U002,D001

CERCLA REF: Y

RQ DESIGNATION: D 5000 pounds (2270 kg) CERCLA

SARA TPQ VALUE: Not listed

SARA Sect. 312

categories:

Acute toxicity: Irritant

Acute toxicity: adverse effect to target organs.

Chronic toxicity: mutagen.

Chronic toxicity: reproductive toxin.

Fire hazard: flammable.

LISTED IN SARA Sect 313: Yes

de minimus CONCENTRATION: 1.0 percent

UNITED STATES POSTAL SERVICE MAILABILITY:

Hazard class: Not given

Mailability: Nonmailable

Max per parcel: 0

NFPA CODES:

HEALTH HAZARD (BLUE): (1) Slightly hazardous to health. As a precaution wear self-contained breathing apparatus.

FLAMMABILITY (RED) : (3) This material can be ignited under almost all temperature conditions.

REACTIVITY (YELLOW): (0) Stable even under fire conditions.

SPECIAL : Unspecified

----- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON -----

ACETONE [67-64-1]

ACGIH TLV list "Threshold Limit Values for 1989-1990"

Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 111 List.

DOT Hazardous Materials Table. 49 CFR 172.101

EPA TSCA Chemical Inventory List 1986

EPA TSCA Chemical Inventory List 1989

EPA TSCA Chemical Inventory List 1990

EPA TSCA Chemical Inventory List 1992

EPA TSCA Test Submission (TSCATS) Database - April 1990

EPA TSCA Test Submission (TSCATS) Database - September 1989

Massachusetts Substance List.

New Jersey Right To Know Substance List. (December 1987)

OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.

OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992

Pennsylvania Hazardous Substance List

RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264

RCRA Hazardous Waste

SARA Section 313 Toxic Chemicals List

Second Third Wastes List. 40 CFR 268.11. 54 FR 26594 (June 23, 1989)

Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)

Washington State Discarded Chemical Products List, November 17, 1989

----- TOXICITY DATA -----

SHORT TERM TOXICITY: INHALATION: levels of 300 ppm have caused irritation of eyes, nose and throat. levels of 500 to 1,000 ppm for 6 hours have caused, in addition, general weakness and heaviness of the eyelids. exposures of 12,000 ppm for a few minutes may cause weakness in arms and legs and fainting. 20,000 ppm may be fatal on brief exposure. SKIN: liquid acetone may cause drying of the skin, irritation, redness, and an increased chance of infection. Eyes: irritation has been reported at 500 ppm after 3-6 hours. splashes into the eye may result in swelling, irritation, damage to the cornea and blindness. INGESTION: 20 ml (2/3 fluid ounce) may result in excess salivation, nausea, vomiting, stomach pain, and possible liver and kidney damage. 200 ml (7 fluid ounces) has resulted in these symptoms and, additionally, swelling of the throat, sores in the mouth and throat, shallow breathing and coma. although 200 ml has been survived with prompt medical attention, death may occur from as little as 100 ml (three and one half fluid ounces). (NYDH)

LONG TERM TOXICITY: levels of 500 to 1,000 ppm can produce eye irritation after 3 hours. daily exposures at this level have resulted in irritation of throat and lungs, dizziness, and inflammation of stomach and intestines. (NYDH)

TARGET ORGANS: respiratory system, skin, eyes, CNS

SYMPTOMS: INHALATION: vapor irritating to eyes and mucous membranes; acts as an anesthetic in very high concentrations. INGESTION: low order of toxicity but very irritating to mucous membranes. SKIN: prolonged excessive contact causes defatting of the skin, possibly leading to dermatitis. Source: CHRIS

CONC IDLH: 20000ppm

NIOSH REL: 250 ppm Time weighted averages for 8-hour exposure
590 mg/M3 Time weighted averages for 8-hour exposure

ACGIH TLV: TLV = 750ppm(1780 mg/M3)
ACGIH STEL: STEL = 1000 ppm(2375 mg/M3)

OSHA PEL: Transitional Limits:
PEL = 1000 ppm(2400mg/M3)
Final Rule Limits:
TWA = 750 ppm (1800 mg/M3)
STEL = 1000 ppm(2400 mg/M3)
STEL DOES NOT APPLY TO THE CELLULOSE ACETATE FIBER INDUSTRY.

MAK INFORMATION: 1000 ppm
2400 mg/M3
Substance elicits very weak effect (MAK > 500 ppm):
Peak = 2xMAK for 60 minutes. 3 times per shift of 8 hours.

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:
IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)
orl-man TDLo:2857 mg/kg 34ZIAG -,64,69
BEHAVIORAL
Coma
KIDNEY, URETER, BLADDER
Other changes

orl-man TDLo:2857 mg/kg DIAEAZ 15,810,66
BEHAVIORAL
Coma
BIOCHEMICAL
Metabolism

Other

ihl-man TCLo:440 ug/m3/6M GISAAA 42(8),42,77
BRAIN AND COVERINGS

Recordings from specific areas of CNS

ihl-man TCLo:10 mg/m3/6H GISAAA 42(8),42,77

BIOCHEMICAL

Metabolism

Other carbohydrates

ihl-hmn TCLo:500 ppm JIHTAB 25,282,43

SENSE ORGANS

Nose

Other

SENSE ORGANS

Eye

Conjunctive irritation

LUNGS, THORAX, OR RESPIRATION

Other changes

ihl-man TCLo:12000 ppm/4H AOHYA3 16,73,73

GASTROINTESTINAL

Nausea or vomiting

BEHAVIORAL

Muscle weakness

LD50 value: orl-rat LD50:5800 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:5800 mg/kg
ihl-rat LC50:50100 mg/m3/8H
ipr-rat LDLo:500 mg/kg
ivn-rat LD50:5500 mg/kg
orl-mus LD50:3000 mg/kg
ihl-mus LCLo:110 gm/m3/1H
ipr-mus LD50:1297 mg/kg
ivn-mus LDLo:4 gm/kg
orl-dog LDLo:8 gm/kg
ipr-dog LDLo:8 gm/kg
scu-dog LDLo:5 gm/kg
orl-rbt LD50:5340 mg/kg
skn-rbt LD50:20 gm/kg
ivn-rbt LDLo:1576 mg/kg
scu-gpg LDLo:5000 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

eye-hmn 500 ppm
skn-rbt 395 mg open MLD
eye-rbt 3950 ug SEV

Reproductive toxicity (1992 RTECS):

This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

ihl-mam TCLo:31500 ug/m3/24H (1-13D preg) GTPZAB
26(6),24,82

EFFECTS ON FERTILITY

Post-implantation mortality

----- EPA's IRIS DATA SUMMARY -----
Acetone; CASRN 67-64-1 (04/01/92)

II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Acetone

CASRN -- 67-64-1

Last Revised -- 12/01/90

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- D; not classifiable as to human carcinogenicity

Basis -- Based on lack of data concerning carcinogenicity in humans or animals.

II.A.2. HUMAN CARCINOGENICITY DATA

None.

II.A.3. ANIMAL CARCINOGENICITY DATA

None.

___II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

Acetone did not show mutagenic activity when tested in Salmonella typhimurium strains TA98 and TA100 or in Schizosaccharomyces pombe strain P1 either in the presence or absence of liver homogenates (McCann et al., 1975; Abbondandolo et al., 1980; Maron et al., 1981; Hallstrom et al., 1981) or in cell transformation systems (Freeman et al., 1973; Rhim et al., 1974; Quarles et al., 1979a,b). Furthermore, acetone gave negative results in assays for chromosomal aberrations and sister chromatid exchange (Norppa et al., 1981; Norppa, 1981; Bates and Kriek, 1981), DNA binding (Kubinski et al., 1981), point mutation in mouse lymphoma cells (Amacher et al., 1980), and transfection of E. coli CR63 cells (Vasavada and Padayatty, 1981). In one study, however, acetone was reported to produce chromosomal aberrations but not sister chromatid exchanges (Kawachi et al., 1980).

___II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

None.

___II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

None.

___II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

___II.D.1. EPA DOCUMENTATION

U.S. EPA. 1988. Updated Health Effects Assessment for Acetone. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Solid Waste and Emergency Response, Washington, DC.

II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The 1988 updated Health Effects Document for Acetone has received Agency review and is approved for publication.

Agency Work Group Review: 12/06/89

Verification Date: 12/06/89

II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

Charles Ris / ORD -- (202)260-5895 / FTS 260-5898

----- PROTECTION AND FIRST AID -----

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

organic vapor canister or air-supplied mask; synthetic rubber gloves;
chemical safety goggles or face splash shield.

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:

Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:

Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:

Promptly when skin becomes wet.

** REMOVE CLOTHING:

Immediately remove any clothing that becomes wet to avoid any flammability

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (ACETONE)

1000 ppm: Any chemical cartridge respirator with organic vapor
cartridge(s). / Any powered air-purifying respirator with organic vapor
cartridge(s). / Any supplied-air respirator. / Any self-contained
breathing apparatus.

6250 ppm: Any supplied-air respirator operated in a continuous flow
mode. * Substance reported to cause eye irritation or damage may require
eye protection.

12500 ppm: Any air-purifying full facepiece respirator (gas mask) with a
chin-style or front- or back-mounted organic vapor canister. / Any
supplied-air respirator with a full facepiece. / Any self-contained
breathing apparatus with a full facepiece.

20000 ppm: Any supplied-air respirator with a full facepiece and operated in a pressure-demand or other positive pressure mode.
EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.: Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: NIOSH

EYE: flush with water immediately for at least 15 min. consult a physician.

SKIN: wash well with water.

INHALATION: if victim overcome, remove to fresh air and call a physician; administer artificial respiration if breathing is irregular or stopped.

INGESTION: seek immediate medical attention

FIRST AID SOURCE: CHRIS Manual 1991

INHALATION: if victim is overcome, remove to fresh air and call a physician; administer artificial respiration if breathing is irregular or stopped.

INGESTION: if victim has swallowed large amounts and is conscious and not having convulsions, induce vomiting and get medical help promptly; no specific antidote known.

SKIN: wash well with water.

EYES: flush with water immediately for at least 15 min. Consult a physician.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

----- INITIAL INCIDENT RESPONSE -----

FIRE EXTINGUISHMENT: Alcohol foam, dry chemical, carbon dioxide. Note: Water in straight hose stream will scatter and spread fire and should not be used. CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).

DOT SHIPPING NAME: Acetone

DOT ID NUMBER: UN1090

ERG90

GUIDE 26

* POTENTIAL HAZARDS *

***FIRE OR EXPLOSION**

Flammable/combustible material; may be ignited by heat, sparks or flames.

Vapors may travel to a source of ignition and flash back.

Container may explode in heat of fire.

Vapor explosion hazard indoors, outdoors or in sewers.

Runoff to sewer may create fire or explosion hazard.

***HEALTH HAZARDS**

May be poisonous if inhaled or absorbed through skin.

Vapors may cause dizziness or suffocation.

Fire may produce irritating or poisonous gases.

Runoff from fire control or dilution water may cause pollution.

*** EMERGENCY ACTION ***

Keep unnecessary people away; isolate hazard area and deny entry.

Stay upwind; keep out of low areas.

Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection.

Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire.

CALL CHEMTREC AT 1-800-424-9300 FOR EMERGENCY ASSISTANCE. If water pollution occurs, notify the appropriate authorities.

***FIRE**

Small Fires: Dry chemical, CO2 or Halon, water spray or alcohol-resistant foam.

Large Fires: Water spray, fog or alcohol-resistant foam.

Move container from fire area if you can do it without risk.

Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks.

For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.

***SPILL OR LEAK**

Shut off ignition sources; no flares, smoking or flames in hazard area.

Stop leak if you can do it without risk.

Water spray may reduce vapors; but it may not prevent ignition in closed spaces.

Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.

Large Spills: Dike far ahead of liquid spill for later disposal.

***FIRST AID**

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen.

In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water.

Remove and isolate contaminated clothing and shoes at the site.

ARSENIC

CHEMTOX DATA

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----- IDENTIFIERS -----

CHEMTOX RECORD 49

LAST UPDATE OF THIS RECORD: 06/03/93

NAME: ARSENIC

SYNONYMS: ARSENICALS; ARSEN (German, Polish); ARSENIC BLACK;
ARSENIC-75; ARSENIC, SOLID; COLLOIDAL ARSENIC; GREY
ARSENIC; METALLIC ARSENIC

CAS: 7440-38-2

RTECS: CG0525000

FORMULA: As4

MOL WT: 299.69

WLN: AS4

CHEMICAL CLASS: Metal

See other identifiers listed below under Regulations.

----- PROPERTIES -----

PHYSICAL DESCRIPTION: silvery to black, brittle; grey, shiny, metallic
looking; crystalline and amorphous metalloid

BOILING POINT: 888 K 614.8 C 1138.7 F

MELTING POINT: 1087 K 813.8 C 1496.9 F

FLASH POINT: NA

AUTO IGNITION: NA

VAPOR PRESSURE: 1mm @ 372 C

UEL: NA

LEL: NA

VAPOR DENSITY: No data

SPECIFIC GRAVITY: 2.026

DENSITY: 5.724 g/mL

WATER SOLUBILITY: INSOL

INCOMPATIBILITIES: oxidizers, acids; bromine oxide,
dirubidium acetylide, halogens,
palladium, zinc, platinum, nitrogen
trichloride, silver nitrate, chromium
trioxide, sodium peroxide

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: CAN REACT VIGOROUSLY ON CONTACT WITH
OXIDIZING MATERIALS. MODERATE FIRE
HAZARD, IN THE FORM OF DUST WHEN
EXPOSED TO HEAT OR FLAME OR BY CHEMICAL
REACTION WITH POWERFUL OXIDIZERS SUCH
AS BROMATES, CHLORATES, IODATES,
PEROXIDES, LITHIUM, NITROGEN
TRICHLORIDE

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: WHEN HEATED OR ON CONTACT WITH ACID OR
ACID FUMES, EMITS HIGHLY TOXIC FUMES

ODOR DETECTED AT (ppm): Unknown
ODOR DESCRIPTION: GARLIC Source:Unspecified
100 % ODOR DETECTION: No data

----- REGULATIONS -----

DOT hazard class: 6.1 POISON
DOT guide: 53
Identification number: UN1558
DOT shipping name: Arsenic
Packing group: II
Label(s) required: POISON
Special provisions:
Packaging exceptions: 173.None
Non bulk packaging: 173.212
Bulk packaging: 173.242
Quantity limitations-
Passenger air/rail: 25 kg
Cargo aircraft only: 100 kg
Vessel stowage: A
Other stowage provisions:M2

STCC NUMBER: 4923207

CLEAN WATER ACT Sect.307:Yes

CLEAN WATER ACT Sect.311:No

National Primary Drinking Water Regulations

Maximum Contaminant Levels (MCL): 0.05 mg/L (12/24/75)

Maximum Contaminant Level Goals (MCLG): Not specified

CLEAN AIR ACT: CAA '90 By category

EPA WASTE NUMBER: D004

CERCLA REF: Y

RQ DESIGNATION: X 1 pound (0.454 kg) CERCLA for pieces of solid meta
with diameter less than 100 micrometers (0.004
inches).

SARA TPQ VALUE: Not listed

SARA Sect. 312
categories:

Chronic toxicity: carcinogen

Chronic toxicity: mutagen.

Chronic toxicity: reproductive toxin.

LISTED IN SARA Sect 313: Yes

de minimus CONCENTRATION: 0.1 percent

UNITED STATES POSTAL SERVICE MAILABILITY:

Hazard class: Poison, Class B - Mailable as ORM-D

Mailability: Domestic service and air transportation shipper's declaration

Max per parcel: 8 OZ

NFPA CODES:

HEALTH HAZARD (BLUE): Unspecified

FLAMMABILITY (RED) : Unspecified
REACTIVITY (YELLOW): Unspecified
SPECIAL : Unspecified

----- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON -----

ACGIH TLV list "Threshold Limit Values for 1989-1990"

ARSENIC [7440-38-2]

ATSDR Toxicology Profile available (NTIS** PB/89/185706/AS)

California OSHA Carcinogens List.

California Assembly Bill 2588 Air Toxics "Hot Spots" Chemicals.

California Assembly Bill 1807 Toxic Air Contaminants.

California Proposition 65 Carcinogen List

Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.

Clean Air Act Section 112 Hazardous Air Pollutants List.

Clean Air Act of November 15, 1990. List of pollutants.

Clean Water Act Section 307 Priority Pollutants

DOT Hazardous Materials Table. 49 CFR 172.101

DOT Marine Pollutant. Proposed list. 57 FR 3854, Jan 31, 1992

EPA Carcinogen Assessment Group List

EPA TSCA Chemical Inventory List 1989

EPA TSCA Chemical Inventory List 1990

EPA TSCA Chemical Inventory List 1992

EPA TSCA Test Submission (TSCATS) Database - April 1990

EPA TSCA Test Submission (TSCATS) Database - September 1989

Massachusetts Substance List.

- National Toxicology Program (NTP) list of human carcinogens

New Jersey DEQ100 list for release reporting.

New Jersey Right To Know Substance List. (December 1987)

- New Jersey Right to Know Substance List. Listed as a carcinogen.

OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.

Pennsylvania Hazardous Substance List

RCRA Hazardous Waste

- RCRA Toxicity Characteristics (TC) list dated March 29, 1990

SARA Section 313 Toxic Chemicals List

Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

----- TOXICITY DATA -----

SHORT TERM TOXICITY: COUGHING, DYSPNEA, CHEST PAINS, IRRITATION TO SKIN AND
MUCOUS MEMBRANES, FEVER, INSOMNIA, ANOREXIA, LIVER
SWELLING, MELANOSIS, DISTURBED HEART FUNCTION AND
FACIAL EDEMA. ** Source: 15

LONG TERM TOXICITY: unknown

TARGET ORGANS:

SYMPTOMS: NAUSEA, VOMITING, DIARRHEA, DEATH Source:

CONC IDLH: 100mg/M3

NIOSH REL: Potential occupational carcinogen 0.002 mg/M3
Ceiling exposures which shall at no time be exceeded

ACGIH TLV: TLV = 0.2mg/M3
ACGIH STEL: Not listed

OSHA PEL: Final Rule Limits:
TWA = 0.01 mg/M3
CONSULT 29CFR 1910.1018

MAK INFORMATION: Not listed

CARCINOGEN?: Y STATUS: See below

REFERENCES: HUMAN POSITIVE IARC** 23,39,80
INDEFINITE IARC** 2,48,73

CARCINOGEN LISTS:

IARC: Carcinogen as defined by
IARC as carcinogenic to humans,
with sufficient epidemiological
evidence.

MAK: Not listed

NIOSH: Carcinogen defined by NIOSH
with no further categorization.

NTP: Carcinogen defined by NTP as
known to be carcinogenic, with
evidence from human studies.

ACGIH: Not listed

OSHA: Cancer hazard

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)

orl-man TDLo:7857 mg/kg/55Y CMAJAX 120,168,79

GASTROINTESTINAL

Changes on structure or function of esophagus

BLOOD

Hemorrhage

SKIN AND APPENDAGES

Skin - after systemic exposure

Dermatitis, other

LD50 value: orl-rat LD50:763 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:763 mg/kg

ipr-rat LD50:13390 ug/kg

orl-mus LD50:145 mg/kg

ipr-mus LD50:46200 ug/kg

scu-rbt LDLo:300 mg/kg

ipr-gpg LDLo:10 mg/kg

scu-gpg LDLo:300 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):

This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

orl-rat TDLo:605 ug/kg (35W pre) GISAAA 42(8),30,77

EFFECTS ON FERTILITY

Pre-implantation mortality

EFFECTS ON FERTILITY

Post-implantation mortality

----- EPA's IRIS DATA SUMMARY -----

Arsenic, inorganic; CASRN 7440-38-2 (04/01/92)

II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Arsenic, inorganic

CASRN -- 7440-38-2

Last Revised -- 02/01/91

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- A; human carcinogen

Basis -- based on observation of increased lung cancer mortality in populations exposed primarily through inhalation and on increased skin cancer incidence in several populations consuming drinking water with high arsenic concentrations.

II.A.2. HUMAN CARCINOGENICITY DATA

Studies of smelter worker populations (Tacoma, WA; Magma, UT; Anaconda, MT; Ronnskar, Sweden; Saganoseki-Machii, Japan) have all found an association between occupational arsenic exposure and lung cancer mortality (Enterline and Marsh, 1982; Lee-Feldstein, 1983; Axelson et al., 1978; Tokudome and Kuratsune, 1976; Rencher et al., 1977). Both proportionate mortality and cohort studies of pesticide manufacturing workers have shown an excess of lung cancer deaths among exposed persons (Ott et al., 1974; Mabuchi et al., 1979). One study of a population residing near a pesticide manufacturing plant revealed that these residents were also at an excess risk of lung cancer (Matanoski et al., 1981). Case reports of arsenical pesticide applicators have also demonstrated an association between arsenic exposure and lung cancer (Roth, 1958).

A cross-sectional study of 40,000 Taiwanese exposed to arsenic in drinking water found significant excess skin cancer prevalence by comparison to 7500 residents of Taiwan and Matsu who consumed relatively arsenic-free water (Tseng et al., 1968). This study design limited its usefulness in risk estimation. Arsenic-induced skin cancer has also been attributed to water supplies in Chile, Argentina and Mexico (Borgono and Greiber, 1972; Bergoglio, 1964; Cebrian et al., 1983). No excess skin cancer incidence has been observed in U.S. residents consuming relatively high levels of arsenic in drinking water (Morton et al., 1976; Southwick et al., 1981). The results of these U.S. studies, however, are not necessarily inconsistent with the existing findings from the foreign populations. The statistical powers of the U.S. studies are considered to be inadequate because of the small sample size.

A follow-up study (Tseng, 1977) of the population living in the same area of Taiwan, where arsenic contamination of the water supply was endemic, found significantly elevated standard mortality ratios for cancer of the bladder, lung, liver, kidney, skin and colon. This study of bladder, liver and lung cancer cases in the endemic area found a significant association with arsenic exposure that was dose-related. The association of arsenic ingestion and cancer of various internal organs has also been cited in a number of case reports (Chen et al., 1985, 1986). Persons treated with arsenic-containing medicinals have also been shown to be at a risk of skin cancer (Sommers and McManus, 1953).

II.A.3. ANIMAL CARCINOGENICITY DATA

None. There has not been consistent demonstration of arsenic carcinogenicity in test animals for various chemical forms administered by different routes to several species (IARC, 1980). There are some data to indicate that arsenic may produce animal tumors if retention time in the lung can be increased (Pershagen et al., 1982, 1984).

II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

Sodium arsenate has been shown to transform Syrian hamster embryo cells (Dipaolo and Casto, 1979) and to produce sister-chromatid-exchange in DON cells, CHO cells and human peripheral lymphocytes exposed in vitro (Wan et al., 1982; Ohno et al., 1982; Larramendy et al., 1981; Andersen, 1983; Crossen, 1983). While arsenic compounds have not been shown to mutate bacterial strains, it produces preferential killing of repair deficient strains (Rossman, 1981).

II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

The Risk Assessment Forum has completed a reassessment of the carcinogenicity risk associated with ingestion of inorganic arsenic. This report, which has been extensively peer-reviewed by outside reviewers (including SAB review) concluded that the most appropriate basis for an oral quantitative estimate was the study by Tseng et al. (1977), which reported increased prevalence of skin cancers in humans as a consequence of arsenic exposure in drinking water. Based on this study a unit risk of $5E-5/\text{ug/L}$ was proposed.

A recent memorandum by the Administrator of the EPA recommended that the above unit risk be adopted. The memorandum further counsels that "in reaching risk management decisions in a specific situation, risk managers must recognize and consider the qualities and uncertainties of risk estimates. The uncertainties associated with ingested inorganic arsenic are such that estimates could be modified downwards as much as an order of magnitude, relative to risk estimates associated with most other carcinogens. In such instances, the management document must clearly articulate this fact and state the factors that influenced such a decision."

II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

II.C.1. SUMMARY OF RISK ESTIMATES

Inhalation Unit Risk -- $4.3E-3/\text{ug/cu.m}$

Extrapolation Method -- absolute-risk linear model

Air Concentrations at Specified Risk Levels:

Risk Level	Concentration
E-4 (1 in 10,000)	$2E-2 \text{ ug/cu.m}$
E-5 (1 in 100,000)	$2E-3 \text{ ug/cu.m}$
E-6 (1 in 1,000,000)	$2E-4 \text{ ug/cu.m}$

___II.C.2. DOSE-RESPONSE DATA FOR CARCINOGENICITY, INHALATION EXPOSURE

Tumor Type -- lung cancer

Test Animals -- human, male

Route -- inhalation, occupational exposure

Reference -- Brown and Chu, 1983a,b,c; Lee-Feldstein, 1983; Higgins, 1982;

Enterline and Marsh, 1982

Ambient Unit Risk Estimates

Exposure Source	Study	Unit Risk	Geometric Mean Unit Risk	Final Estimates Unit Risk
Anaconda smelter	Brown and Chu,	1.25 E-3		
	1983a,b,c			
	Lee-Feldstein, 1983	2.80 E-3	2.56 E-3	
	Higgins, 1982;	4.90 E-3		4.29 E-3
	Higgins et al., 1982;			
	Welch et al., 1982			
ASARCO smelter	Enterline and	6.81 E-3	7.19 E-3	
	Marsh, 1982	7.60 E-3		

___II.C.3. ADDITIONAL COMMENTS (CARCINOGENICITY, INHALATION EXPOSURE)

A geometric mean was obtained for data sets obtained within distinct exposed populations (U.S. EPA, 1984). The final estimate is the geometric mean of those two values. It was assumed that the increase in age-specific mortality rate of lung cancer was a function only of cumulative exposures.

The unit risk should not be used if the air concentration exceeds 2 ug/cu.m, since above this concentration the unit risk may not be appropriate.

___II.C.4. DISCUSSION OF CONFIDENCE (CARCINOGENICITY, INHALATION EXPOSURE)

Overall a large study population was observed. Exposure assessments included air measurements for the Anaconda smelter and both air measurements and urinary arsenic for the ASARCO smelter. Observed lung cancer incidence was significantly increased over expected values. The range of the estimates derived from data from two different exposure areas was within a factor of 6.

___II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

___II.D.1. EPA DOCUMENTATION

U.S. EPA. 1984. Health Assessment Document for Inorganic Arsenic.
Environmental Criteria and Assessment Office, Research Triangle Park, NC.
EPA 600/8-83-021F.

___II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The 1984 Health Assessment Document for Inorganic Arsenic received Agency and external review including a review by SAB.

Agency Work Group Review: 01/13/88

Verification Date: 01/13/88

___II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

Herman J. Gibb / ORD -- (202)260-5898 / FTS 260-5898

Chao W. Chen / ORD -- (202)260-5898 / FTS 260-5898

----- PROTECTION AND FIRST AID -----

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (ARSENIC)

Unknown concentration or Greater than 20000 ug/M3 (20 mg/M3) or
Firefighting: Any full facepiece self-contained breathing apparatus
operated in positive pressure mode.

Not greater than 20000 ug/M3 (20 mg/M3): Supplied air respirator with
full facepiece hood, or helmet or suit and operated in positive pressure
mode.

Not greater than 10000 ug/M3 (10 mg/M3): (A) Powered air-purifying
respirators in all inlet face coverings with high efficiency filters.1
(B) Half-mask supplied air respirators operated in positive pressure
mode.

Not greater than 500 ug/M3: (A) Full facepiece air-purifying respirator
equipped with high-efficiency filter.1 (B) Any full facepiece supplied
air respirator. (C) Any full facepiece self-contained breathing
apparatus.

Not greater than 100 ug/M3: (A) Half-mask air-purifying respirator

equipped with high-efficiency filter.1 (B) Any half-mask supplied air respirator.

FIRST AID SOURCE: THIC

EYE: irrigate eyes with water.

SKIN: wash contaminated areas of body with soap and water.

INHALATION: None given

INGESTION: None given

FIRST AID SOURCE: DOT Emergency Response Guide 1990.

Move victim to fresh air; call emergency medical care. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site.

----- INITIAL INCIDENT RESPONSE -----

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).

DOT SHIPPING NAME: Arsenic

DOT ID NUMBER: UN1558

ERG90

GUIDE 53

* POTENTIAL HAZARDS *

*HEALTH HAZARDS

Poisonous if swallowed.

Inhalation of dust poisonous.

Fire may produce irritating or poisonous gases.

Runoff from fire control or dilution water may cause pollution.

*FIRE OR EXPLOSION

Some of these materials may burn, but none of them ignites readily.

* EMERGENCY ACTION *

Keep unnecessary people away; isolate hazard area and deny entry.

Stay upwind; keep out of low areas.

Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection.

CALL CHEMTREC AT 1-800-424-9300 FOR EMERGENCY ASSISTANCE. If water pollution occurs, notify the appropriate authorities.

*FIRE

Small Fires: Dry chemical, CO2, water spray or regular foam.

Large Fires: Water spray, fog or regular foam.

Move container from fire area if you can do it without risk.

*SPILL OR LEAK

Do not touch or walk through spilled material; stop leak if you can do it without risk.

Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.

Small Dry Spills: With clean shovel place material into clean, dry container and cover; move containers from spill area.

Large Spills: Dike far ahead of liquid spill for later disposal.

***FIRST AID**

Move victim to fresh air; call emergency medical care.

In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes.

Remove and isolate contaminated clothing and shoes at the site.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.

The COMPILERS of the CHEMTOX database shall not be held liable for inaccuracies or omissions within this database, or in any of its printed or displayed output forms.

BARIUM METAL

CHEMTOX DATA

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----- IDENTIFIERS -----

CHEMTOX RECORD 743

LAST UPDATE OF THIS RECORD: 06/03/93

NAME: BARIUM METAL

SYNONYMS: ; BARIUM

CAS: 7440-39-3

RTECS: CA8370000

FORMULA: Ba

MOL WT: 137.34

WLN: .BA

CHEMICAL CLASS: Metal

See other identifiers listed below under Regulations.

----- PROPERTIES -----

PHYSICAL DESCRIPTION: silver-white slightly lustrous, somewhat malleable metal.

BOILING POINT: 1913 K 1639.8 C 2983.7 F

MELTING POINT: 998 K 724.8 C 1336.7 F

FLASH POINT: NA

AUTO IGNITION: NA

VAPOR PRESSURE: 10 mm @ 1049 C

UEL: NA

LEL: NA

VAPOR DENSITY: No data

SPECIFIC GRAVITY: 3.6

DENSITY: 3.5 @20 C

WATER SOLUBILITY: DECOMPOSES

INCOMPATIBILITIES: water, oxidizing agents, oxygen, acids, chlorinated solvents

REACTIVITY WITH WATER: MOISTURE SENSITIVE Source: ALD

REACTIVITY WITH COMMON MATERIALS: No data

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors

ODOR DETECTED AT (ppm): Unknown

ODOR DESCRIPTION: No data

100 % ODOR DETECTION: No data

----- REGULATIONS -----

DOT hazard class: 4.3 DANGEROUS WHEN WET

DOT guide: 40

Identification number: UN1400

DOT shipping name: Barium

Packing group: II

Label(s) required: DANGEROUS WHEN WET
Special provisions: A19
Packaging exceptions: 173.None
Non bulk packaging: 173.212
Bulk packaging: 173.241
Quantity limitations-
Passenger air/rail: 15 kg
Cargo aircraft only: 50 kg
Vessel stowage: E
Other stowage provisions:

STCC NUMBER: Not listed

CLEAN WATER ACT Sect.307:No

CLEAN WATER ACT Sect.311:No

National Primary Drinking Water Regulations

Maximum Contaminant Levels (MCL): 2 mg/L (01/01/93)

Maximum Contaminant Level Goals (MCLG): 2 mg/L (01/01/93)

CLEAN AIR ACT: Not listed

EPA WASTE NUMBER: D005,D003

CERCLA REF: Not listed

RQ DESIGNATION: Not listed

SARA TPQ VALUE: Not listed

SARA Sect. 312

categories:

Acute toxicity: adverse effect to target organs.

Fire hazard: flammable.

Reactive hazard: water reactive.

LISTED IN SARA Sect 313: Yes

de minimus CONCENTRATION: 1.0 percent

UNITED STATES POSTAL SERVICE MAILABILITY:

Not given

NFPA CODES:

HEALTH HAZARD (BLUE): Unspecified

FLAMMABILITY (RED) : Unspecified

REACTIVITY (YELLOW): Unspecified

SPECIAL : Unspecified

----- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON -----

BARIUM METAL [7440-39-3]

DOT Marine Pollutant. Proposed list. 57 FR 3854, Jan 31, 1992

EPA TSCA Chemical Inventory List 1990

EPA TSCA Chemical Inventory List 1992

EPA TSCA Test Submission (TSCATS) Database - September 1989

Massachusetts Substance List.

New Jersey Right To Know Substance List. (December 1987)

Pennsylvania Hazardous Substance List

RCRA Hazardous Waste
RCRA Toxicity Characteristics (TC) list dated March 29, 1990
SARA Section 313 Toxic Chemicals List
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

----- TOXICITY DATA -----

SHORT TERM TOXICITY: Unknown

LONG TERM TOXICITY: unknown

TARGET ORGANS: skin, eyes

SYMPTOMS: DERMATITIS, DEPILATION, VERTIGO, NAUSEA, VOMITING,
COLIC, DIARRHEA, RAPID RESPIRATION, HYPERTENSION,
IRREGULAR HEART ACTION, CYANOSIS, MUSCULAR WEAKNESS,
TREMOR, LUMBAR PAIN, CONVULSION, PARALYSIS. Source:
THC

CONC IDLH: Unknown

NIOSH REL:

ACGIH TLV: Not listed

ACGIH STEL: Not listed

OSHA PEL: Not in Table Z-1-A

MAK INFORMATION: 0.5 calculated as total dust mg/M3
Substance with systemic effects, onset of effect less
than or equal to 2 hrs: Peak = 2xMAK for 30 minutes, 4
times per shift of 8 hours.

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:

IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

LD50 value: No LD50 in RTECS 1992

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):

This chemical has no known mammalian reproductive toxicity.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

----- PROTECTION AND FIRST AID -----

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (BARIUM METAL)

5 mg/M3G/ mg/M33: Any dust and mist respirator except single-use and quarter-mask respirators. / Any supplied-air respirator. / Any self-contained breathing apparatus.

12.5 mg/M3G/ mg/M33: Any powered air-purifying respirator with a dust and mist filter. / Any supplied-air respirator operated in a continuous flow mode.

25 mg/M3G/ mg/M33: Any air-purifying full facepiece respirator with a high-efficiency particulate filter. / Any powered air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter. / Any supplied-air respirator with a tight-fitting facepiece operated in a continuous flow mode. / Any self-contained breathing apparatus with a full facepiece. / Any supplied-air respirator with a full facepiece.

250 mg/M3G/ mg/M33: Any supplied-air respirator with a full facepiece and operated in a pressure-demand or other positive pressure mode.

EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.: Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.

ESCAPE: Any air-purifying full facepiece respirator with a high-efficiency particulate filter. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: THIC NIOSHP

EYE: flush with water

SKIN: wash with soap and water

INHALATION: None given

INGESTION: gastric lavage followed by saline catharsis. treat muscular convulsion by injection of calcium gluconate.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.

Move victim to fresh air; call emergency medical care. Wipe material from skin immediately; flush skin or eyes with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site.

----- INITIAL INCIDENT RESPONSE -----

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).

DOT SHIPPING NAME: Barium
DOT ID NUMBER: UN1400

ERG90

GUIDE 40

* POTENTIAL HAZARDS *

*FIRE OR EXPLOSION

May ignite itself if exposed to air.
May re-ignite after fire is extinguished.
May ignite in presence of moisture.
Violent reaction with water produces flammable gas.
Runoff to sewer may create fire or explosion hazard.

*HEALTH HAZARDS

May be poisonous if inhaled.
Contact may cause burns to skin and eyes.
Fire may produce irritating or poisonous gases.

* EMERGENCY ACTION *

Keep unnecessary people away; isolate hazard area and deny entry.
Stay upwind; keep out of low areas.
Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection.
CALL CHEMTREC AT 1-800-424-9300 FOR EMERGENCY ASSISTANCE. If water pollution occurs, notify the appropriate authorities.

*FIRE

Do not use water or foam.
Small Fires: Dry chemical, soda ash, lime or sand.
Large Fires: Withdraw from area and let fire burn.
Magnesium Fires: Use dry sand, Met-L-X R powder or G-1 graphite powder.
Lithium Fires: Use dry sand, Lith-X R powder or G-1 graphite powder.
Move container from fire area if you can do it without risk.

*SPILL OR LEAK

Shut off ignition sources; no flares, smoking or flames in hazard area.
Do not touch or walk through spilled material; stop leak if you can do it without risk.
No water on spilled material; do not get water inside container.
Small Dry Spills: With clean shovel place material into clean, dry container and cover loosely; move containers from spill area.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Large Spills: Dike liquid spill for later disposal.
Cover powder spill with plastic sheet or tarp to minimize spreading.

*FIRST AID

Move victim to fresh air; call emergency medical care.
Wipe material from skin immediately; flush skin or eyes with running water for at least 15 minutes.
Remove and isolate contaminated clothing and shoes at the site.

BENZENE

CHEMTOX DATA

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----- IDENTIFIERS -----

CHEMTOX RECORD 59

LAST UPDATE OF THIS RECORD: 06/03/93

NAME: BENZENE

SYNONYMS: BENZOL; COAL TAR NAPHTHA; CYCLOHEXATRIENE; PHENYL HYDRIDE;
PHENE; COAL NAPHTHA; PYROBENZOL

CAS: 71-43-2

RTECS: CY1400000

FORMULA: C6H6

MOL WT: 78.11

WLN: RH

CHEMICAL CLASS: Aromatic hydrocarbon

See other identifiers listed below under Regulations.

----- PROPERTIES -----

PHYSICAL DESCRIPTION: colorless to pale yellow watery liquid with a
gasoline-like odor

BOILING POINT: 353.15 K 80 C 176 F

MELTING POINT: 278.71 K 5.5 C 42 F

FLASH POINT: 262 K -11.15 C 11.9 F

AUTO IGNITION: 864.8 K 591.6 C 1588.6 F

CRITICAL TEMP: 562.1 K 288.95 C 552.11 F

CRITICAL PRESS: 4.89 kN/M2 48.2 atm 708 psia

HEAT OF VAP: 169 Btu/lb 93.85 cal/g 3.927x E5 J/kg

HEAT OF COMB: -17460 Btu/lb -9707 cal/g -406x E5 J/kg

VAPOR PRESSURE: 75 mm @ 20 C

UEL: 7.1 %

LEL: 1.3 %

IONIZATION POTENTIAL (eV): 9.25

VAPOR DENSITY: 2.77 (air=1)

EVAPORATION RATE: 3.50 (n-BUTYL ACETATE=1)

SPECIFIC GRAVITY: 0.86-0.88 20 C

DENSITY: 0.8794 @ 20 C

WATER SOLUBILITY: 0.06%

INCOMPATIBILITIES: strong ox, chlorine, bromine with iron

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: OXIDIZING MATERIALS (Br2, F2, Cl2, CrO3,
NaClO4, O2, O3), PERCHLORATES (AlCl3
+NaClO4), (H2SO4 & PERMANGANATES),
K2O2, (AgClO4 & ACETIC ACID), Na2O2
Source: SAX

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES:

VAPOR IS HEAVIER THAN AIR AND MAY
TRAVEL CONSIDERABLE DISTANCE TO SOURCE
OF IGNITION AND FLASH BACK.

ODOR DETECTED AT (ppm): 4.68 ppm
ODOR DESCRIPTION: odor; characteristic odor Source: CHRIS
100 % ODOR DETECTION: No data

----- REGULATIONS -----

DOT hazard class: 3 FLAMMABLE LIQUID
DOT guide: 27
Identification number: UN1114
DOT shipping name: Benzene
Packing group: II
Label(s) required: FLAMMABLE LIQUID
Special provisions: T8
Packaging exceptions: 173.150
Non bulk packaging: 173.202
Bulk packaging: 173.242
Quantity limitations-
Passenger air/rail: 5 L
Cargo aircraft only: 60 L
Vessel stowage: B
Other stowage provisions: 40

STCC NUMBER: 4908110

CLEAN WATER ACT Sect.307: Yes

CLEAN WATER ACT Sect.311: Yes

National Primary Drinking Water Regulations

Maximum Contaminant Levels (MCL): 0.005 mg/L (01/09/89)

Maximum Contaminant Level Goals (MCLG): 0 mg/L (01/09/89)

CLEAN AIR ACT: CAA '90 Listed and CAA '77 Sect 109

EPA WASTE NUMBER: U019, D018, D001

CERCLA REF: Y

RQ DESIGNATION: A 10 pounds (4.54 kg) CERCLA

SARA TPQ VALUE: Not listed

SARA Sect. 312

categories:

Acute toxicity: Irritant

Acute toxicity: adverse effect to target organs.

Chronic toxicity: carcinogen

Chronic toxicity: mutagen.

Chronic toxicity: reproductive toxin.

Fire hazard: flammable.

LISTED IN SARA Sect 313: Yes

de minimus CONCENTRATION: 0.1 percent

UNITED STATES POSTAL SERVICE MAILABILITY:

Hazard class: Not given

Mailability: Nonmailable

Max per parcel: 0

NFPA CODES:

HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with

self-contained breathing apparatus.
FLAMMABILITY (RED) : (3) This material can be ignited under almost all
temperature conditions.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

----- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON -----

ACGIH TLV list "Threshold Limit Values for 1989-1990"
ATSDR Toxicology Profile available (NTIS** PB/89/209464/AS)
BENZENE [71-43-2]
California OSHA Carcinogens List.
California Assembly Bill 1803 Well Monitoring Chemicals.
California Assembly Bill 2588 Air Toxics "Hot Spots" Chemicals.
California Assembly Bill 1807 Toxic Air Contaminants.
California Proposition 65 Carcinogen List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 111 List.
Clean Air Act Section 112 Hazardous Air Pollutants List.
Clean Air Act of November 15, 1990. List of pollutants.
Clean Water Act Section 307 Priority Pollutants
Clean Water Act Section 311 Hazardous Chemicals List.
DOT Hazardous Materials Table. 49 CFR 172.101
DOT Marine Pollutant. Proposed list. 57 FR 3854, Jan 31, 1992
EPA Carcinogen Assessment Group List
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
National Toxicology Program (NTP) list of human carcinogens
New Jersey Right To Know Substance List. (December 1987)
New Jersey Right to Know Substance List. Listed as a carcinogen.
New Jersey Right to Know Substance List. Listed as a mutagen.
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992
OSHA Specifically regulated substance. See 29 CFR 1910.1028
Pennsylvania Hazardous Substance List
RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264
RCRA Hazardous Waste
RCRA Toxicity Characteristics (TC) list dated March 29, 1990
SARA Section 313 Toxic Chemicals List
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
Suspected carcinogen (ACGIH). "Threshold Limit Values for 1989-1990"
Washington State Discarded Chemical Products List, November 17, 1989
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

----- TOXICITY DATA -----

SHORT TERM TOXICITY: INHALATION: benzene may produce both nerve and blood

effects. irritation of the nose, throat and lungs may occur (3,000 ppm may be tolerated for only 30 to 60 minutes). lung congestion may occur. nerve effects may include an exaggerated feeling of well-being, excitement, headache, dizziness and slurred speech. at high levels, slowed breathing and death may result. death has occurred at 20,000 ppm for 5 to 10 minutes, or 7,500 ppm for 30 minutes. SKIN: irritation may occur, with redness and blistering if not promptly removed. benzene is poorly absorbed. whole body exposure for 30 minutes has been reported with no health effects. Eyes: may cause severe irritation. INGESTION: may cause irritation of mouth, throat and stomach. symptoms are similar to those listed under inhalation. one tablespoon may cause collapse, bronchitis, pneumonia and death. (NYDH)

LONG TERM TOXICITY: may cause loss of appetite, nausea, weight loss, fatigue, muscle weakness, headache, dizziness, nervousness and irritability. mild anemia has been reported from exposures of 25 ppm for several years and 100 ppm for 3 months. at levels between 100 and 200 ppm for periods of 6 months, or more, severe irreversible blood changes and damage to liver and heart may occur. temporary partial paralysis has been reported. (NYDH)

TARGET ORGANS: blood, CNS, skin, bone marrow, eyes, resp sys

SYMPTOMS: Dizziness, excitation, pallor, followed by flushing, weakness, headache, breathlessness, chest constriction. Coma and possible death. Source: CHRIS

CONC IDLH: 3000ppm

NIOSH REL: Potential occupational carcinogen 0.1 ppm Time weighted averages for 8-hour exposure 0.32 mg/M3 Time weighted averages for 8-hour exposure 1 ppm Ceiling exposures which shall at no time be exceeded 3.2 mg/M3 Ceiling exposures which shall at no time be exceeded

ACGIH TLV: TLV = 10ppm Suspected human carcinogen (A2)
ACGIH STEL: Suspected human carcinogen (A2)

OSHA PEL: Final Rule Limits:
TWA = 1 ppm
STEL = 5 ppm
CONSULT 29CFR 1910.1028

MAK INFORMATION: Danger of cutaneous absorption
Carcinogenic working material without MAK
Capable of inducing malignant tumors as shown by experience with humans.

CARCINOGEN?: Y STATUS: See below

REFERENCES:

HUMAN SUSPECTED IARC** 7,203,74
HUMAN SUSPECTED IARC** 28,151,82
ANIMAL SUSPECTED IARC** 28,151,82
ANIMAL SUSPECTED IARC** 29,93,82
HUMAN POSITIVE IARC** 29,93,82
ANIMAL INDEFINITE IARC** 7,203,74

CARCINOGEN LISTS:

IARC: Carcinogen as defined by
IARC as carcinogenic to humans,
with sufficient epidemiological
evidence.
MAK: Capable of inducing malignant
tumors as shown by experience in
humans.
NIOSH: Carcinogen defined by NIOSH
with no further categorization.
NTP: Carcinogen defined by NTP as
known to be carcinogenic, with
evidence from human studies.
ACGIH: Carcinogen defined by ACGIH
TLV Committee as a suspected
carcinogen, based on either
limited epidemiological evidence or
demonstration of carcinogenicity
in experimental animals.
OSHA: Cancer hazard

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)

* ihl-hmn LCLo:2 pph/5M TABIA2 3,231,33
* orl-man LDLo:50 mg/kg YAKUD5 22,883,80
* ihl-hmn LCLo:2000 ppm/5M YAKUD5 22,883,80
ihl-man TCLo:150 ppm/1Y-I BLUTA9 28,293,74
BLOOD
Other changes
NUTRITIONAL AND GROSS METABOLIC
Changes in:
Body temperature increase
ihl-hmn TCLo:100 ppm INMEAF 17,199,48
BEHAVIORAL
Somnolence(general depressed activity)
GASTROINTESTINAL
Nausea or vomiting
SKIN AND APPENDAGES
Skin - after systemic exposure
Dermatitis, other

ihl-hmn LCLo:65 mg/m3/5Y ARGEAR 44,145,74
BLOOD
Other changes

LD50 value: orl-rat LD50:930 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:930 mg/kg
ihl-rat LC50:10000 ppm/7H
ipr-rat LD50:2890 ug/kg
orl-mus LD50:4700 mg/kg
ihl-mus LC50:9980 ppm
ipr-mus LD50:340 mg/kg
orl-dog LDLo:2 gm/kg
ihl-dog LCLo:146000 mg/m3
ihl-cat LCLo:170000 mg/m3
ihl-rbt LCLo:45000 ppm/30M
ivn-rbt LDLo:88 mg/kg
ipr-gpg LDLo:527 mg/kg
scu-frg LDLo:1400 mg/kg
ihl-mam LCLo:20000 ppm/5M
ipr-mam LDLo:1500 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):

This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

ihl-rat TCLo:670 mg/m3/24H (15D pre/1-22D preg) HYSAAV
33(1-3),327,68
EFFECTS ON FERTILITY
Female fertility index

ihl-rat TCLo:56600 ug/m3/24H (1-22D preg) HYSAAV
33(7-9),112,68
EFFECTS ON NEWBORN

ihl-rat TCLo:50 ppm/24H (7-14D preg) JHEMA2 24,363,80
EFFECTS ON EMBRYO OR FETUS
Extra embryonic features(e.g.,placenta,umbilical
cord)
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

ihl-rat TCLo:150 ppm/24H (7-14D preg) JHEMA2 24,363,80
EFFECTS ON FERTILITY
Post-implantation mortality
SPECIFIC DEVELOPMENTAL ABNORMALITIES

Musculoskeletal system

orl-mus TDLo:9 gm/kg (6-15D preg) TJADAB 19,41A,79
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

orl-mus TDLo:12 gm/kg (6-15D preg) TJADAB 19,41A,79
EFFECTS ON FERTILITY
Post-implantation mortality

orl-mus TDLo:6500 mg/kg (8-12D preg) TCMUD8 6,361,86
EFFECTS ON NEWBORN
Growth statistics(e.g.,reduced weight gain)

ihl-mus TCLo:500 ppm/7H (6-15D preg) AIHAAP 40,993,79
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-mus TCLo:500 mg/m3/12H (6-15D preg) ATSUDG 8,425,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-mus TCLo:5 ppm (6-15D preg) TXCYAC 42,171,86
EFFECTS ON EMBRYO OR FETUS
Cytological changes(including somatic cell genetic material)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Blood and lymphatic systems(including spleen and marrow)

ihl-mus TCLo:20 ppm/6H (6-15D preg) FAATDF 10,224,88
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Blood and lymphatic systems(including spleen and marrow)

ipr-mus TDLo:5 mg/kg (1D male) TPKVAL 15,30,79
EFFECTS ON FERTILITY
Pre-implantation mortality
EFFECTS ON EMBRYO OR FETUS
Fetal death

scu-mus TDLo:1100 mg/kg (12D preg) TOXID9 1,125,81
EFFECTS ON EMBRYO OR FETUS
Other effects on embryo or fetus

scu-mus TDLo:7030 mg/kg (12-13D preg) SEIJBO 15,47,75
EFFECTS ON EMBRYO OR FETUS
Extra embryonic features(e.g.,placenta,umbilical cord)

EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ivn-mus TDLo:13200 ug/kg (13-16D preg) ICHUDW
4(6),24,82
EFFECTS ON EMBRYO OR FETUS
Cytological changes(including somatic cell genetic
material)

par-mus TDLo:4 gm/kg (12D preg) NEZAAQ 25,438,70
EFFECTS ON NEWBORN
Weaning or lactation index(#alive at weaning per #
alive at day 4)

ihl-rbt TCLo:1 gm/m3/24H (7-20D preg) ATSUDG 8,425,85
EFFECTS ON FERTILITY
Post-implantation mortality
EFFECTS ON FERTILITY
Abortion
EFFECTS ON EMBRYO OR FETUS
Fetal death

NO SIGNIFICANT
RISK LEVEL(Ca P65): 20 micrograms/day

----- EPA's IRIS DATA SUMMARY -----
Benzene; CASRN 71-43-2 (04/01/92)

II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Benzene
CASRN -- 71-43-2
Last Revised -- 04/01/92

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- A; human carcinogen

Basis -- Several studies of increased incidence of nonlymphocytic leukemia from occupational exposure, increased incidence of neoplasia in rats and mice exposed by inhalation and gavage, and some supporting data form the basis for this classification.

II.A.2. HUMAN CARCINOGENICITY DATA

Aksoy et al. (1974) reported effects of benzene exposure among 28,500 Turkish workers employed in the shoe industry. Mean duration of employment was 9.7 years (1-15 year range) and mean age was 34.2 years. Peak exposure was reported to be 210-650 ppm. Twenty-six cases of leukemia and a total of 34 leukemias or preleukemias were observed, corresponding to an incidence of 13/100,000 (by comparison to 6/100,000 for the general population). A follow-up paper (Aksoy, 1980) reported eight additional cases of leukemia as well as evidence suggestive of increases in other malignancies.

In a retrospective cohort mortality study Infante et al. (1977a,b) examined leukemogenic effects of benzene exposure in 748 white males exposed while employed in the manufacturing of rubber products. Exposure occurred from 1940-1949, and vital statistics were obtained through 1975. A statistically significant increase (p less than or equal to 0.002) of leukemias was found by comparison to the general U.S. population. There was no evidence of solvent exposure other than benzene. Air concentrations were generally found to be below the recommended limits in effect during the study period.

In a subsequent retrospective cohort mortality study Rinsky et al. (1981) observed seven deaths from leukemia among 748 workers exposed to benzene and followed for at least 24 years (17,020 person-years). This increased incidence was statistically significant; standard mortality ratio (SMR) was 560. For the five leukemia deaths that occurred among workers with more than 5 years exposure, the SMR was 2100. Exposures (which ranged from 10-100 ppm 8-hour TWA) were described as less than the recommended standards for the time period of 1941-1969.

In an updated version of the Rinsky et al. (1981) study, the authors followed the same cohort to 12/31/81 (Rinsky et al., 1987). In his earlier study, cumulative exposure was derived from historic air-sampling data or interpolated estimates based on existing data. Standardized mortality rates ranged from 109 at cumulative benzene exposures under 40 ppm-years and increased monotonically to 6637 (6 cases) at 400 ppm-years or more. The authors found significantly elevated risks of leukemia at cumulative exposures less than the equivalent current standard for occupational exposure which is 10 ppm over a 40-year working lifetime.

Ott et al. (1978) observed three deaths from leukemia among 594 workers followed for at least 23 years in a retrospective cohort mortality study, but the increase was not statistically significant. Exposures ranged from <2 to >25 ppm 8-hour TWA.

Wong et al. (1983) reported on the mortality of male chemical workers who had been exposed to benzene for at least 6 months during the years 1946-1975. The study population of 4062 persons was drawn from seven chemical plants, and jobs were categorized as to peak exposure. Those with at least 3 days/week exposure (3036 subjects) were further categorized on the basis of an 8-hour TWA. The control subjects held jobs at the same plants for at least 6 months but were never subject to benzene exposure. Dose-dependent increases were seen in leukemia and lymphatic and hematopoietic cancer. The incidence of leukemia was responsible for the majority of the increase. It was noted that the significance of the increase is due largely to a less than expected incidence of neoplasia in the unexposed subjects.

Numerous other epidemiologic and case studies have reported an increased incidence or a causal relationship between leukemia and exposure to benzene (IARC, 1982).

II.A.3. ANIMAL CARCINOGENICITY DATA

Both gavage and inhalation exposure of rodents to benzene have resulted in development of neoplasia. Maltoni and Scarnato (1979) and Maltoni et al. (1983) administered benzene by gavage at dose levels of 0, 50, 250, and 500 mg/kg bw to 30-40 Sprague-Dawley rats/sex for life. Dose-related increased incidences of mammary tumors were seen in females and of Zymbal gland carcinomas, oral cavity carcinomas and leukemias/lymphomas in both sexes.

In an NTP (1986) study, benzene was administered by gavage doses of 0, 50, 100, or 200 mg/kg bw to 50 F344/N rats/sex or 0, 25, 50, or 100 mg/kg bw to 50 B6C3F1 mice/sex. Treatment was 5 times/week for 103 weeks. Significantly increased incidences ($p < 0.05$) of various neoplastic growths were seen in both sexes of both species. Both male and female rats and mice had increased incidence of carcinomas of the Zymbal gland. Male and female rats had oral cavity tumors, and males showed increased incidences of skin tumors. Mice of both sexes had increased incidence of lymphomas and lung tumors. Males were observed to have harderian and preputial gland tumors and females had tumors of mammary gland and ovary. In general, the increased incidence was dose-related.

Slightly increased incidences of hematopoietic neoplasms were reported for male C57Bl mice exposed by inhalation to 300 ppm benzene 6 hours/day, 5 days/week for 488 days. There was no increase in tumor incidence in male AKR or CD-1 mice similarly exposed to 100 ppm or 100 or 300 ppm benzene, respectively. Likewise male Sprague-Dawley rats exposed by inhalation to 300 ppm benzene were not observed to have increased incidence of neoplasia (Snyder et al., 1981).

Maltoni et al. (1983) treated male and female Sprague-Dawley rats in the following manner. Starting at 13 weeks of age rats were exposed to 200 ppm benzene 4 hours/day, 5 days/week for 7 weeks; 200 ppm 7 hours/day, 5 days/week for 12 weeks; 300 ppm 7 hours/day, 5 days/week for 85 weeks. An 8-hour/day TWA for 5 days/week was calculated to be 241 ppm. A statistically significant increase was noted in hepatomas and carcinomas of the Zymbal gland.

II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

Numerous investigators have found significant increases in chromosomal aberrations of bone marrow cells and peripheral lymphocytes from workers with exposure to benzene (IARC, 1982). Benzene also induced chromosomal aberrations in bone marrow cells from rabbits (Kissling and Speck, 1973), mice (Meyne and Legator, 1980) and rats (Anderson and Richardson, 1979). Several investigators have reported positive results for benzene in mouse micronucleus assays (Meyne and Legator, 1980). Benzene was not mutagenic in several bacterial and yeast systems, in the sex-linked recessive lethal mutation assay with *Drosophila melanogaster* or in mouse lymphoma cell forward mutation assay.

II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

II.B.1. SUMMARY OF RISK ESTIMATES

Oral Slope Factor -- $2.9E-2$ per (mg/kg)/day

Drinking Water Unit Risk -- $8.3E-7$ per (ug/L)

Extrapolation Method -- One-hit (pooled data)

Drinking Water Concentrations at Specified Risk Levels:

Risk Level	Concentration
-----	-----
E-4 (1 in 10,000)	$1E+2$ ug/L
E-5 (1 in 100,000)	$1E+1$ ug/L
E-6 (1 in 1,000,000)	$1E+0$ ug/L

II.B.2. DOSE-RESPONSE DATA (CARCINOGENICITY, ORAL EXPOSURE)

Tumor Type -- leukemia

Test Animals -- human

Route -- inhalation, occupational exposure

Reference -- Rinsky et al., 1981; Ott et al., 1978; Wong et al., 1983

The slope factor was derived from human data for inhalation exposure (see dose-response data for inhalation quantitative estimate). The human respiratory rate was assumed to be 20 cu.m/day and the human drinking water intake was assumed to be 2 L/day. The fraction of the administered dose absorbed systemically via inhalation and via drinking water were assumed to be equal.

II.B.3. ADDITIONAL COMMENTS (CARCINOGENICITY, ORAL EXPOSURE)

The unit risk estimate is the geometric mean of four ML point estimates using pooled data from the Rinsky et al. (1981) and Ott et al. (1978) studies, which was then adjusted for the results of the Wong et al. (1983) study as described in the additional comments section for inhalation data.

The unit risk should not be used if the water concentration exceeds $1E+4$ ug/L, since above this concentration the unit risk may not be appropriate.

II.B.4. DISCUSSION OF CONFIDENCE (CARCINOGENICITY, ORAL EXPOSURE)

The pooled cohorts were sufficiently large and were followed for an adequate time period. The increases in leukemias were statistically significant and dose-related in one of the studies. Wong et al. (1983) disagrees that exposures reported in Rinsky et al. (1981) were within the recommended standards. For the five leukemia deaths in persons with 5 or more years exposure, the author notes that mean exposure levels (range 15-70 ppm) exceeded the recommended standard (25 ppm) in 75% of the work locations sampled. A total of 21 unit risk estimates were prepared using 6 models and various combinations of the epidemiologic data. These range over slightly more than one order of magnitude. A geometric mean of these estimates is $2.7E-2$. Regression models give an estimate similar to the geometric mean.

The risk estimate above based on reconsideration of the Rinsky et al. (1981) and Ott et al. (1978) studies is very similar to that of $2.4E-2$ /ppm (cited in U.S. EPA, 1980) based on Infante et al. (1977a,b), Ott et al. (1978) and Aksoy et al. (1974). It was felt by the authors of U.S. EPA (1985) that the exposure assessment provided by Aksoy was too imprecise to warrant inclusion in the current risk estimate.

Risk estimates based on animal gavage studies are about 5 times higher than those derived from human data. Pharmacokinetic data which could impact the risk assessment are currently being evaluated.

II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

___II.C.1. SUMMARY OF RISK ESTIMATES

Inhalation Unit Risk -- $8.3E-6$ per (ug/cu.m)

Extrapolation Method -- One-hit (pooled data)

Air Concentrations at Specified Risk Levels:

Risk Level	Concentration
-----	-----
E-4 (1 in 10,000)	$1E+1$ ug/cu.m
E-5 (1 in 100,000)	$1E+0$ ug/cu.m
E-6 (1 in 1,000,000)	$1E-1$ ug/cu.m

___II.C.2. DOSE-RESPONSE DATA FOR CARCINOGENICITY, INHALATION EXPOSURE

Tumor Type -- leukemia

Test Animals -- humans

Route -- inhalation, occupational exposure

Reference -- Rinsky et al., 1981; Ott et al., 1978; Wong et al., 1983

___II.C.3. ADDITIONAL COMMENTS (CARCINOGENICITY, INHALATION EXPOSURE)

The unit risk estimate is the geometric mean of four ML point estimates using pooled data from the Rinsky et al. (1981) and Ott et al. (1978) studies, which was then adjusted for the results of the Wong et al. (1983) study. The Rinsky data used were from an updated tape which reports one more case of leukemia than was published in 1981. Equal weight was given to cumulative dose and weighted cumulative dose exposure categories as well as to relative and absolute risk model forms. The results of the Wong et al. (1983) study were incorporated by assuming that the ratio of the Rinsky-Ott-Wong studies to the Rinsky-Ott studies for the relative risk cumulative dose model was the same as for other model-exposure category combinations and multiplying this ratio by the Rinsky-Ott geometric mean. The age-specific U.S. death rates for 1978 (the most current year available) were used for background leukemia and total death rates. It should be noted that a recently published paper (Rinsky et al., 1987) reported yet another case of leukemia from the study population.

The unit risk should not be used if the air concentration exceeds 100 ug/cu.m, since above this concentration the unit risk may not be appropriate.

___II.C.4. DISCUSSION OF CONFIDENCE (CARCINOGENICITY, INHALATION EXPOSURE)

The pooled cohorts were sufficiently large and were followed for an adequate time period. The increases in leukemias were statistically significant and dose-related in one of the studies. Wong et al. (1983) disagrees that

exposures reported in Rinsky et al. (1981) were within the recommended standards. For the five leukemia deaths in persons with 5 or more years exposure, the author notes that mean exposure levels (range 15-70 ppm) exceeded the recommended standard (25 ppm) in 75% of the work locations sampled. The risk estimate above based on reconsideration of the Rinsky et al. (1981) and Ott et al. (1978) studies is very similar to that of $2.4E-2/ppm$ (cited in U.S. EPA, 1980) based on Infante et al. (1977a,b), Ott et al. (1978) and Aksoy et al. (1974). It was felt by the authors of U.S. EPA (1985) that the exposure assessment provided by Aksoy was too imprecise to warrant inclusion in the current risk estimate. A total of 21 unit risk estimates were prepared using 6 models and various combinations of the epidemiologic data. These range over slightly more than one order of magnitude. A geometric mean of these estimates is $2.7E-2/ppm$. Regression models give an estimate similar to the geometric mean.

II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

II.D.1. EPA DOCUMENTATION

U.S. EPA. 1980. Ambient Water Quality Criteria Document for Benzene. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office (Cincinnati, OH) and Carcinogen Assessment Group (Washington, DC), and the Environmental Research Labs (Corvallis, OR; Duluth, MN; Gulf Breeze, FL) for the Office of Water Regulations and Standards, Washington, DC. EPA 440/5-80-018.

U.S. EPA. 1985. Interim Quantitative Cancer Unit Risk Estimates Due to Inhalation of Benzene. Prepared by the Office of Health and Environmental Assessment, Carcinogen Assessment Group, Washington, DC for the Office of Air Quality Planning and Standards, Washington, DC.

U.S. EPA. 1987. Memorandum from J. Orme, HEB, CSD/ODW to C. Vogt, Criteria and Standards Division, ODW, June, 1987.

II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The 1985 Interim Evaluation was reviewed by the Carcinogen Assessment Group.

The 1987 memorandum is an internal document.

Agency Work Group Review: 03/05/87, 10/09/87

Verification Date: 10/09/87

___II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

D.L. Bayliss / ORD -- (202)260-5726 / FTS 260-5726

R. McGaughy / ORD -- (202)260-5898 / FTS 260-5898

----- PROTECTION AND FIRST AID -----

PROTECTION SUGGESTED

FROM THE CHRIS MANUAL:

hydrocarbon vapor canister, supplied air or hose mask;
hydrocarbon-insoluble rubber or plastic gloves; chemical goggles or face
splash shield; hydrocarbon-insoluble apron such as neoprene.

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:

Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:

Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:

Promptly wash with soap when skin becomes contaminated.

** REMOVE CLOTHING:

Immediately remove any clothing that becomes wet to avoid any flammability

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (BENZENE)

Less than or equal to 10 ppm: Half-mask air-purifying respirator with
organic vapor cartridge.

Less than or equal to 50 ppm: Full facepiece respirator with organic
vapor cartridges. / Full facepiece gas mask with chin style canister.

Less than or equal to 100 ppm: Full facepiece powered air-purifying
respirator with organic vapor canister.

Less than or equal to 1000 ppm: Supplied air respirator with full
facepiece in positive-pressure mode.

Greater than 1000 ppm or Unknown concentration: (1) Self-contained
breathing apparatus with full face-piece in positive pressure mode. (2)
Full facepiece positive-pressure supplied-air respirator with auxiliary
self-contained air supply.

Escape : (1) Any organic vapor gas mask; or (2) Any self-contained
breathing apparatus with full facepiece.

Firefighting : Any full facepiece self-contained breathing apparatus
operated in positive pressure mode.

FIRST AID SOURCE: NIOSHP

EYE: irr immed
SKIN: soap wash promptly
INHALATION: art resp
INGESTION: no vomit

FIRST AID SOURCE: CHRIS Manual 1991
SKIN: flush with water followed by soap and water; remove contaminated clothing and wash skin.
EYES: flush with plenty of water until irritation subsides.
INHALATION: remove from exposure immediately. Call a physician. IF breathing is irregular or stopped, start resuscitation, administer oxygen.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

----- INITIAL INCIDENT RESPONSE -----

FIRE EXTINGUISHMENT: Dry chemical, foam, or carbon dioxide. Note: Water may be ineffective CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).

DOT SHIPPING NAME: Benzene
DOT ID NUMBER: UN1114

ERG90

GUIDE 27

* POTENTIAL HAZARDS *

*FIRE OR EXPLOSION

Flammable/combustible material; may be ignited by heat, sparks or flames.

Vapors may travel to a source of ignition and flash back.

Container may explode in heat of fire.

Vapor explosion hazard indoors, outdoors or in sewers.

Runoff to sewer may create fire or explosion hazard.

*HEALTH HAZARDS

May be poisonous if inhaled or absorbed through skin.

Vapors may cause dizziness or suffocation.

Contact may irritate or burn skin and eyes.

Fire may produce irritating or poisonous gases.

Runoff from fire control or dilution water may cause pollution.

* EMERGENCY ACTION *

Keep unnecessary people away; isolate hazard area and deny entry.

Stay upwind; keep out of low areas.

Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection.

Isolate for 1/2 mile in all direction if tank, rail car or tank truck is involved in fire.

CALL CHEMTREC AT 1-800-424-9300 FOR EMERGENCY ASSISTANCE. If water pollution occurs, notify the appropriate authorities.

***FIRE**

Small Fires: Dry chemical, CO2, water spray or regular foam.

Large Fires: Water spray, fog or regular foam.

Move container from fire area if you can do it without risk.

Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks.

For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

Withdraw immediately in case of rising sound of venting safety device or any discoloration of tank due to fire.

***SPILL OR LEAK**

Shut off ignition sources; no flares, smoking or flames in hazard area. Stop leak if you can do it without risk.

Water spray may reduce vapor; but it may not prevent ignition in closed spaces.

Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.

Large Spills: Dike far ahead of liquid spill for later disposal.

***FIRST AID**

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen.

In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water.

Remove and isolate contaminated clothing and shoes at the site.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement. The COMPILERS of the CHEMTOX database shall not be held liable for inaccuracies or omissions within this database, or in any of its printed or displayed output forms.

2-BUTANONE

CHEMTOX DATA

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----- IDENTIFIERS -----

CHEMTOX RECORD 511

LAST UPDATE OF THIS RECORD: 06/03/93

NAME: 2-BUTANONE

SYNONYMS: ACETONE, METHYL-; AETHYLMETHYLKETON (German); BUTANONE;
BUTANONE 2 (French); ETHYL METHYL CETONE (French);
ETHYLMETHYLKETON (Dutch); ETHYL METHYL KETONE; ETHYL
METHYL KETONE (DOT); KETONE, ETHYL METHYL; MEETCO; METHYL
ACETONE; METHYL ACETONE (DOT); METHYL ETHYL KETONE; METHYL
ETHYL KETONE (DOT); METILETILCHETONE (Italian);
METYLOETYLOKETON (Polish); 2-BUTANONE; MEK; BUTAN-2-ONE;
KETONE, METHYL ETHYL; 2-OXOBUTANE; METHYL ETHYL KETONE
(MEK)

CAS: 78-93-3

RTECS: EL6475000

FORMULA: C4H8O

MOL WT: 72.12

WLN: 2V1

CHEMICAL CLASS: Ketone

See other identifiers listed below under Regulations.

----- PROPERTIES -----

PHYSICAL DESCRIPTION: clear colorless liquid with a fragrant, mint-like,
moderately sharp odor

BOILING POINT: 352.72 K 79.5 C 175.2 F

MELTING POINT: 187.04 K -86.2 C -123 F

FLASH POINT: 267.4 K -5.75 C 21.6 F

AUTO IGNITION: 788.7 K 515.5 C 1451.6 F

CRITICAL TEMP: 535.7 K 262.55 C 504.59 F

CRITICAL PRESS: 4.15 kN/M2 40.9 atm 601 psia

HEAT OF VAP: 191 Btu/lb 106.07 cal/g 4.438x E5 J/kg

HEAT OF COMB: -13480 Btu/lb -7494 cal/g -313x E5 J/kg

VAPOR PRESSURE: 71.2 mm Hg @ 20 C

UEL: 11.5 %

LEL: 1.8 %

IONIZATION POTENTIAL (eV): 6.7

VAPOR DENSITY: 2.42 (air=1)

EVAPORATION RATE: 7.12

SPECIFIC GRAVITY: 0.806 @ 20 C

DENSITY: 0.805 g/mL @ 20 C

WATER SOLUBILITY: 27%

INCOMPATIBILITIES: very strong oxidizers, chlorosulfonic
acid, oleum, potassium-tert-butoxide,
heat or flame, chloroform, hydrogen
peroxide, nitric acid

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: NO REACTION Source: SAX

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: NOT PERTINENT Source: SAX
POLYMERIZATION POSSIBILITIES: NOT PERTINENT Source: SAX

TOXIC FIRE GASES: UNBURNED VAPORS
ODOR DETECTED AT (ppm): 10 ppm
ODOR DESCRIPTION: Like acetone; pleasant; pungent
Source: CHRIS
100 % ODOR DETECTION: 6.0 ppm

----- REGULATIONS -----

DOT hazard class: 3 FLAMMABLE LIQUID
DOT guide: 26
Identification number: UN1193
DOT shipping name: Ethyl methyl ketone [or] methyl ethyl ketone
Packing group: II
Label(s) required: FLAMMABLE LIQUID
Special provisions: T8
Packaging exceptions: 173.150
Non bulk packaging: 173.202
Bulk packaging: 173.242
Quantity limitations-
Passenger air/rail: 5 L
Cargo aircraft only: 60 L
Vessel stowage: B
Other stowage provisions:

STCC NUMBER: 4909243

CLEAN WATER ACT Sect.307: No
CLEAN WATER ACT Sect.311: No
CLEAN AIR ACT: CAA '90 Listed
EPA WASTE NUMBER: U159, D035, D001
CERCLA REF: Y
RQ DESIGNATION: D 5000 pounds (2270 kg) CERCLA
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:

Acute toxicity: Irritant
Acute toxicity: adverse effect to target organs.
Chronic toxicity: mutagen.
Chronic toxicity: reproductive toxin.
Fire hazard: flammable.

LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 1.0 percent

UNITED STATES POSTAL SERVICE MAILABILITY:
Hazard class: Flammable liquid - Mailable as ORM-D
Mailability: Domestic surface mail only
Max per parcel: 1 QT METAL; 1 PT OTHER

NFPA CODES:

HEALTH HAZARD (BLUE): (1) Slightly hazardous to health. As a precaution wear self-contained breathing apparatus.
FLAMMABILITY (RED) : (3) This material can be ignited under almost all temperature conditions.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

----- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON -----

2-BUTANONE [78-93-3]

ACGIH TLV list "Threshold Limit Values for 1989-1990"

California Assembly Bill 1803 Well Monitoring Chemicals.

Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.

Clean Air Act Section 111 List.

Clean Air Act of November 15, 1990. List of pollutants.

DOT Hazardous Materials Table. 49 CFR 172.101

EPA TSCA 8(a) Preliminary Assessment Information Rule - effective 11/19/82

EPA TSCA 8(d) Health and Safety Data Rule - effective date 10/04/82

EPA TSCA Chemical Inventory List 1986

EPA TSCA Chemical Inventory List 1989

EPA TSCA Chemical Inventory List 1990

EPA TSCA Chemical Inventory List 1992

EPA TSCA Test Submission (TSCATS) Database - April 1990

EPA TSCA Test Submission (TSCATS) Database - September 1989

First Third Wastes List. 40 CFR 268.10. 54 FR 26594 (June 23, 1989)

Massachusetts Substance List.

New Jersey Right To Know Substance List. (December 1987)

OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.

OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992

Pennsylvania Hazardous Substance List

RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264

RCRA Hazardous Waste

RCRA Toxicity Characteristics (TC) list dated March 29, 1990

SARA Section 313 Toxic Chemicals List

Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)

Washington State Discarded Chemical Products List, November 17, 1989

----- TOXICITY DATA -----

SHORT TERM TOXICITY: INHALATION: human exposures to levels of 350 ppm caused irritation of the nose and throat. numbness in fingers, arms and legs accompanied by headache, nausea, vomiting and fainting have occurred after exposure to levels of 300-600 ppm. SKIN: contact with liquid or vapor at levels of 300-600 ppm caused severe irritation. liquid is absorbed readily and may cause numbing of fingers and arms. Eyes: exposure to levels of 200 ppm produced irritation. INGESTION: can cause irritation of the mouth, throat and stomach, the severity of which will be dependent upon amount swallowed. symptoms of poisoning include nausea, vomiting, stomach pain and diarrhea. death can occur

from ingestion of as little as 1 ounce.(NYDH)

LONG TERM TOXICITY: has been implicated in certain nervous disorders characterized by weakness, fatigue, heaviness in chest and numbness of hands and feet. these symptoms may develop after 1 year of exposure to vapor concentrations of 50-200 ppm. improvement is gradual and may take years after exposure is discontinued.(NYDH)

TARGET ORGANS: CNS, lungs. peripheral nervous system. eye irritation at 350 ppm.

SYMPTOMS: Liquid causes eye burn. Vapor irritates eyes, nose, and throat; can cause headache, dizziness, nausea, weakness, and loss of consciousness. Source: CHRIS

CONC IDLH: 3000ppm

NIOSH REL: 200 ppm Time weighted averages for 8-hour exposure
590 mg/M3 Time weighted averages for 8-hour exposure

ACGIH TLV: TLV = 200ppm(590 mg/M3)

ACGIH STEL: STEL = 300 ppm

OSHA PEL: Transitional Limits:
PEL = 200 ppm(590mg/M3)
Final Rule Limits:
TWA = 200 ppm (590 mg/M3)
STEL = 300 ppm(885 mg/M3)

MAK INFORMATION: 200 ppm
590 mg/M3
Substance with systemic effects, onset of effect less than or equal to 2 hrs: Peak = 2xMAK for 30 minutes, 4 times per shift of 8 hours.

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:
IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)
ihl-hmn TCLO:100 ppm/5M JIHTAB 25,282,43
SENSE ORGANS
Nose
Other

SENSE ORGANS

Eye

Conjunctive irritation

LUNGS, THORAX, OR RESPIRATION

Other changes

LD50 value: orl-rat LD50:2737 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:2737 mg/kg
ihl-rat LC50:23500 mg/m3/8H
ipr-rat LD50:607 mg/kg
orl-mus LD50:4050 mg/kg
ihl-mus LC50:40 gm/m3/2H
ipr-mus LD50:616 mg/kg
skn-rbt LD50:6480 mg/kg
ipr-gpg LDLo:2000 mg/kg
ihl-mam LC50:38 gm/m3

IRRITATION DATA: (Source: NIOSH RTECS 1992)

eye-hmn 350 ppm
skn-rbt 500 mg/24H MOD
skn-rbt 402 mg/24H MLD
skn-rbt 13780 ug/24H open MLD
eye-rbt 80 mg

Reproductive toxicity (1992 RTECS):

This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

ihl-rat TCLo:3000 ppm/7H (6-15D preg) TXAPA9 28,452,74
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Craniofacial(including nose and tongue)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Urogenital system
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Homeostatis

----- EPA's IRIS DATA SUMMARY -----

Methyl ethyl ketone (MEK); CASRN 78-93-3 (04/01/92)

II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Methyl ethyl ketone (MEK)

CASRN -- 78-93-3

Last Revised -- 12/01/89

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood

that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- D; not classifiable as to human carcinogenicity

Basis -- Based on no human carcinogenicity data and inadequate animal data.

II.A.2. HUMAN CARCINOGENICITY DATA

None.

II.A.3. ANIMAL CARCINOGENICITY DATA

Inadequate. No data were available to assess the carcinogenic potential of methyl ethyl ketone by the oral or inhalation routes. In a skin carcinogenesis study, two groups of 10 male C3H/He mice received dermal applications of 50 mg of a solution containing 25 or 29% methyl ethyl ketone in 70% dodecylbenzene twice a week for 1 year. No skin tumors developed in the group of mice treated with 25% methyl ethyl ketone. After 27 weeks, a single skin tumor developed in 1 of 10 mice receiving 29% methyl ethyl ketone (Horton et al., 1965).

II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

Methyl ethyl ketone was not mutagenic for *Salmonella typhimurium* strains TA98, TA100, TA1535, or TA1537 with or without rat hepatic homogenates (Florin et al., 1980; Douglas et al., 1980). Methyl ethyl ketone induced aneuploidy in the diploid D61, M strain of *Saccharomyces cerevisiae* (Zimmermann et al., 1985). Low levels of methyl ethyl ketone combined with low levels of nocodazole (another inducer of aneuploidy), also produced significantly elevated levels of aneuploidy in the system (Mayer and Goin, 1987).

__II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

None.

__II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

None.

__II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

__II.D.1. EPA DOCUMENTATION

U.S. EPA. 1985. Health and Environmental Effects Profile for Methyl Ethyl Ketone. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Solid Waste and Emergency Response, Washington, DC.

U.S. EPA. 1988. Updated Health Effects Assessment for Methyl Ethyl Ketone. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Solid Waste and Emergency Response, Washington, DC.

__II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The 1988 Updated Health Effects Assessment for Methyl Ethyl Ketone has received Agency review.

Agency Work Group Review: 05/30/89

Verification Date: 05/30/89

__II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

- Dharm V. Singh / ORD -- (202)260-5958 / FTS 260-5958

----- PROTECTION AND FIRST AID -----

PROTECTION SUGGESTED

FROM THE CHRIS MANUAL:

organic canister or air pack; plastic gloves; goggles or face shield.

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:

Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:

Reasonable probability of eye contact.

** REMOVE CLOTHING:

Promptly remove non-impervious clothing that becomes contaminated.

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (2-BUTANONE)

1000 ppm: Any powered air-purifying respirator with organic vapor cartridge(s). * Substance causes eye irritation or damage; eye protection needed. / Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s).

3000 ppm: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any supplied-air respirator operated in a continuous flow mode. * Substance causes eye irritation or damage; eye protection needed. / Any self-contained breathing apparatus with a full facepiece. / Any supplied-air respirator with a full facepiece.

EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.:

Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.

ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: CHRIS Manual 1991

INHALATION: remove victim to fresh air; if breathing is irregular or has stopped, start resuscitation and administer oxygen.

EYES: wash with plenty of water for at least 15 min. and call physician.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

----- INITIAL INCIDENT RESPONSE -----

FIRE EXTINGUISHMENT: Alcohol foam, dry chemical, or carbon dioxide.
Note: Water may be ineffective CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport
Information - Publication DOT 5800.5 (1990).

DOT SHIPPING NAME: Ethyl methyl ketone [or] methyl ethyl ketone

DOT ID NUMBER: UN1193

ERG90

GUIDE 26

* POTENTIAL HAZARDS *

*FIRE OR EXPLOSION

Flammable/combustible material; may be ignited by heat, sparks or flames.

Vapors may travel to a source of ignition and flash back.

Container may explode in heat of fire.

Vapor explosion hazard indoors, outdoors or in sewers.

Runoff to sewer may create fire or explosion hazard.

*HEALTH HAZARDS

May be poisonous if inhaled or absorbed through skin.

Vapors may cause dizziness or suffocation.

Fire may produce irritating or poisonous gases.

Runoff from fire control or dilution water may cause pollution.

* EMERGENCY ACTION *

Keep unnecessary people away; isolate hazard area and deny entry.

Stay upwind; keep out of low areas.

Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection.

Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire.

CALL CHEMTREC AT 1-800-424-9300 FOR EMERGENCY ASSISTANCE. If water pollution occurs, notify the appropriate authorities.

*FIRE

Small Fires: Dry chemical, CO2 or Halon, water spray or alcohol-resistant foam.

Large Fires: Water spray, fog or alcohol-resistant foam.

Move container from fire area if you can do it without risk.

Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks.

For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.

*SPILL OR LEAK

Shut off ignition sources; no flares, smoking or flames in hazard area.

Stop leak if you can do it without risk.

Water spray may reduce vapors; but it may not prevent ignition in closed spaces.

Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.

Large Spills: Dike far ahead of liquid spill for later disposal.

***FIRST AID**

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen.

In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water.

Remove and isolate contaminated clothing and shoes at the site.

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CHROMIUM

CHEMTOX DATA

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----- IDENTIFIERS -----

CHEMTOX RECORD 116
NAME: CHROMIUM
SYNONYMS:
CAS: 7440-47-3
FORMULA: Cr
WLN: CR
CHEMICAL CLASS: Metal

LAST UPDATE OF THIS RECORD: 06/03/93
RTECS: GB4200000
MOL WT: 51.996

See other identifiers listed below under Regulations.

----- PROPERTIES -----

PHYSICAL DESCRIPTION: steel-gray metal or silver metal powder. (nydh)
BOILING POINT: 2915 K 2641.8 C 4787.3 F
MELTING POINT: 2173 K 1899.8 C 3451.7 F
FLASH POINT: NA
AUTO IGNITION: NA
VAPOR PRESSURE:
UEL: NA
LEL: NA
VAPOR DENSITY: No data
SPECIFIC GRAVITY: No data
DENSITY: 7.200
WATER SOLUBILITY:
INCOMPATIBILITIES: strong oxidizers

REACTIVITY WITH WATER: No data on water reactivity
REACTIVITY WITH COMMON MATERIALS: No data
STABILITY DURING TRANSPORT: No Data
NEUTRALIZING AGENTS: No data
POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors
ODOR DETECTED AT (ppm): Unknown
ODOR DESCRIPTION: NONE Source: NYDH
100 % ODOR DETECTION: No data

----- REGULATIONS -----

DOT hazard class: 9 CLASS 9
DOT guide: 31
Identification number: UN3077
DOT shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCES, SOLID, N.O.S. (CHROMIUM)
Packing group: III
Label(s) required: CLASS 9

Special provisions: 8, B54
Packaging exceptions: 173.155
Non bulk packaging: 173.213
Bulk packaging: 173.240
Quantity limitations-
Passenger air/rail: NONE
Cargo aircraft only: NONE
Vessel stowage: A
Other stowage provisions:

STCC NUMBER: Not listed

CLEAN WATER ACT Sect.307:Yes

CLEAN WATER ACT Sect.311:No

National Primary Drinking Water Regulations

Maximum Contaminant Levels (MCL): 0.1 mg/L (07/30/92)

Maximum Contaminant Level Goals (MCLG): 0.1 mg/L (07/30/92)

CLEAN AIR ACT: CAA '90 By category

EPA WASTE NUMBER: D007

CERCLA REF: Y

RQ DESIGNATION: D 5000 pounds (2270 kg) CERCLA for pieces of solid metal with diameter less than 100 micrometers (0.004 inches).

SARA TPQ VALUE: Not listed

SARA Sect. 312
categories:

Chronic toxicity: carcinogen

LISTED IN SARA Sect 313: Yes

de minimus CONCENTRATION: 0.1 percent

UNITED STATES POSTAL SERVICE MAILABILITY:
Not given

NFPA CODES:

HEALTH HAZARD (BLUE): Unspecified
FLAMMABILITY (RED) : Unspecified
REACTIVITY (YELLOW): Unspecified
SPECIAL : Unspecified

----- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON -----

ACGIH TLV list "Threshold Limit Values for 1989-1990"

ATSDR Toxicology Profile available (NTIS** PB/89/236665/AS)

CHROMIUM [7440-47-3]

California Assembly Bill 1807 Toxic Air Contaminants.

Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.

Clean Air Act of November 15, 1990. List of pollutants.

Clean Water Act Section 307 Priority Pollutants

EPA TSCA Chemical Inventory List 1986

EPA TSCA Chemical Inventory List 1989

EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
National Toxicology Program (NTP) list of human carcinogens
New Jersey DEQ100 list for release reporting.
New Jersey Right To Know Substance List. (December 1987)
New Jersey Right to Know Substance List. Listed as a carcinogen.
New Jersey Right to Know Substance List. Listed as a mutagen.
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
Pennsylvania Hazardous Substance List
RCRA Hazardous Waste
RCRA Toxicity Characteristics (TC) list dated March 29, 1990
SARA Section 313 Toxic Chemicals List
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

----- TOXICITY DATA -----

SHORT TERM TOXICITY: INHALATION: dust may cause irritation of the nose,
throat and lungs. SKIN: dust may cause irritation.
Eyes: dust may cause irritation. INGESTION: dust may
cause irritation of the mouth and throat.(NYDH)

LONG TERM TOXICITY: no information found on exposure to chromium metal.
see specific chromium compounds.(NYDH)

TARGET ORGANS:

SYMPTOMS: HISTOLOGIC FIBROSIS OF LUNGS Source: NIOSHP

CONC IDLH: Unknown

NIOSH REL:

ACGIH TLV: TLV = 0.5mg/M3

ACGIH STEL: Not listed

OSHA PEL: Transitional Limits:

PEL = 1mg/M3

Final Rule Limits:

TWA = 1 mg/M3

MAK INFORMATION: Not listed

CARCINOGEN?: Y STATUS: See below

REFERENCES:

ANIMAL SUSPECTED IARC** 2,100,73

ANIMAL INDEFINITE IARC** 23,205,80

CARCINOGEN LISTS:

IARC: Not classified as to human
carcinogenicity or probably not
carcinogenic to humans.
MAK: Not listed
NIOSH: Not listed
NTP: Carcinogen defined by NTP as
known to be carcinogenic, with
evidence from human studies.
ACGIH: Not listed
OSHA: Not listed

LD50 value: No LD50 in RTECS 1992

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

unr-rat LD50:27500 ug/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):

This chemical has no known mammalian reproductive toxicity.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

----- EPA's IRIS DATA SUMMARY -----
Chromium(VI); CASRN 7440-47-3 (04/01/92)

II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Chromium(VI)
CASRN -- 7440-47-3
Last Revised -- 03/01/91

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- A; human carcinogen

Basis -- Results of occupational epidemiologic studies of chromium-exposed workers are consistent across investigators and study populations. Dose-response relationships have been established for chromium exposure and lung cancer. Chromium-exposed workers are exposed to both chromium III and chromium VI compounds. Because only chromium VI has been found to be carcinogenic in animal studies, however, it was concluded that only chromium VI should be classified as a human carcinogen.

II.A.2. HUMAN CARCINOGENICITY DATA

Sufficient. Epidemiologic studies of chromate production facilities in the United States (Machle and Gregorius, 1948; Brinton et al., 1952; Mancuso and Hueper, 1951; Mancuso, 1975; Baetjer, 1950; Taylor, 1966; Enterline, 1974; Hayes et al., 1979; Hill and Ferguson, 1979), Great Britain (Bidstrup, 1951; Bidstrup and Case, 1956; Alderson et al., 1981), Japan (Watanabe and Fukuchi, 1975; Ohsaki et al., 1978; Sano and Mitohara, 1978; Satoh et al., 1981) and West Germany (Korallus et al., 1982; Bittersohl, 1971) have established an association between chromium (Cr) exposure and lung cancer. Most of these studies did not attempt to determine whether Cr III or Cr VI compounds were the etiologic agents.

Three studies of the chrome pigment industry, one in Norway (Langard and Norseth, 1975), one in England (Davies, 1978, 1979), and the third in the Netherlands and Germany (Frentzel-Beyme, 1983) also found an association between occupational chromium exposure (predominantly to Cr VI) and lung cancer.

Results of two studies of the chromium plating industry (Royle, 1975; Silverstein et al., 1981) were inconclusive, while the findings of a Japanese study of chrome platers were negative (Okubo and Tsuchiya, 1979). The results of studies of ferrochromium workers (Pokrovskaya and Shabynina, 1973; Langard et al., 1980; Axelsson et al., 1980) were inconclusive as to lung cancer risk.

II.A.3. ANIMAL CARCINOGENICITY DATA

Sufficient. Hexavalent chromium compounds were carcinogenic in animal assays producing the following tumor types: intramuscular injection site tumors in Fischer 344 and Bethesda Black rats and in C57BL mice (Furst et al., 1976; Maltoni, 1974, 1976; Payne, 1960; Heuper and Payne, 1959); intraplural implant site tumors for various chromium VI compounds in Sprague-Dawley and Bethesda Black rats (Payne, 1960; Heuper 1961; Heuper and Payne, 1962); intrabronchial implantation site tumors for various Cr VI compounds in Wistar rats (Levy and Martin, 1983; Laskin et al., 1970; Levy as quoted

in NIOSH, 1975); and subcutaneous injection site sarcomas in Sprague-Dawley rats (Maltoni, 1974, 1976).

___II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

A large number of chromium compounds have been assayed in in vitro genetic toxicology assays. In general, hexavalent chromium is mutagenic in bacterial assays whereas trivalent chromium is not (Lofroth, 1978; Petrellie and Flora, 1977, 1978). Likewise Cr VI but not Cr III was mutagenic in yeasts (Bonatti et al., 1976) and in V79 cells (Newbold et al., 1979). Chromium III and VI compounds decrease the fidelity of DNA synthesis in vitro (Loeb et al., 1977), while Cr VI compounds inhibit replicative DNA synthesis in mammalian cells (Levis et al., 1978) and produce unscheduled DNA synthesis, presumably repair synthesis, as a consequence of DNA damage (Raffetto, 1977). Chromate has been shown to transform both primary cells and cell lines (Fradkin et al., 1975; Tsuda and Kato, 1977; Casto et al., 1979). Chromosomal effects produced by treatment with chromium compounds have been reported by a number of authors; for example, both Cr VI and Cr III salts were clastogenic for cultured human leukocytes (Nakamuro et al., 1978).

There are no long-term studies of ingested Cr VI. There appears to be significant in vivo conversion of Cr VI to Cr III and III to VI; Cr III is an essential trace element.

___II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

Not available.

___II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

___II.C.1. SUMMARY OF RISK ESTIMATES

Inhalation Unit Risk -- $1.2E-2$ per (ug/cu.m)

Extrapolation Method -- Multistage, extra risk

Air Concentrations at Specified Risk Levels:

Risk Level	Concentration
-----	-----
E-4 (1 in 10,000)	$8E-3$ ug/cu.m
E-5 (1 in 100,000)	$8E-4$ ug/cu.m

II.C.2. DOSE-RESPONSE DATA FOR CARCINOGENICITY, INHALATION EXPOSURE

Species/Strain Tumor Type	Dose	Tumor Incidence	Reference

human	Route: Occupational exposure (inhalation)		
Age (years)	Midrange (ug/cu.m)	Deaths from Lung Cancer	Person Years
50	5.66	3	1345
	25.27	6	931
	46.83	6	299
60	4.68	4	1063
	20.79	5	712
	39.08	5	211
70	4.41	2	401
	21.29	4	345

II.C.3. ADDITIONAL COMMENTS (CARCINOGENICITY, INHALATION EXPOSURE)

The cancer mortality in Mancuso (1975) was assumed to be due to Cr VI, which was further assumed to be no less than one-seventh of total chromium. It was also assumed that the smoking habits of chromate workers were similar to those of the U.S. white male population. The unit risks of Langard et al. (1980), Axelsson et al. (1980), and Pokrovskaya and Shabynina (1973) are 1.3E-1, 3.5E-2 and 9.2E-2 per (ug/cu.m), respectively.

Hexavalent chromium compounds have not produced lung tumors in animals by inhalation. Trivalent chromium compounds have not been reported as carcinogenic by any route of administration.

The unit risk should not be used if the air concentration exceeds 8E-1 ug/cu.m, since above this concentration the unit risk may not be appropriate.

II.C.4. DISCUSSION OF CONFIDENCE (CARCINOGENICITY, INHALATION EXPOSURE)

Results of studies of chromium exposure are consistent across investigators and countries. A dose-relationship for lung tumors has been established. The assumption that the ratio of Cr III to Cr VI is 6:1 may lead to a 7-fold underestimation of risk. The use of 1949 hygiene data, which may underestimate worker exposure, may result in an overestimation of risk.

Further overestimation of risk may be due to the implicit assumption that the smoking habits of chromate workers were similar to those of the general white male population, since it is generally accepted that the proportion of smokers is higher for industrial workers than for the general population.

__II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

__II.D.1. EPA DOCUMENTATION

Mancuso, T.F. 1975. International Conference on Heavy Metals in the Environment. Toronto, Ontario, Canada.

U.S. EPA. 1984. Health Assessment Document for Chromium. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH. EPA 600/8-83-014F.

__II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The quantification of cancer risk in the 1984 Health Assessment Document has received peer review in public sessions of the Environmental Health Committee of the U.S. EPA's Science Advisory Board.

Agency Work Group Review: 06/26/86

Verification Date: 06/26/86

__II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

Herman J. Gibb / ORD -- (202)260-5898 / FTS 260-5898

Chao W. Chen / ORD -- (202)260-5719 / FTS 260-5719

----- PROTECTION AND FIRST AID -----

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

**** WEAR EYE PROTECTION TO PREVENT:**

Reasonable probability of eye contact.

**** EXPOSED PERSONNEL SHOULD WASH:**

Promptly when skin becomes contaminated.

**** REMOVE CLOTHING:**

Promptly remove non-impervious clothing that becomes contaminated.

**** REFERENCE: NIOSH**

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (CHROMIUM)

2.5 mg/M3: Any dust and mist respirator except single-use respirators. * Substance reported to cause eye irritation or damage may require eye protection.

5 mg/M3: Any dust and mist respirator except single-use and quarter-mask respirators. * Substance reported to cause eye irritation or damage may require eye protection. / Any supplied-air respirator. * Substance reported to cause eye irritation or damage may require eye protection. / Any self-contained breathing apparatus. * Substance reported to cause eye irritation or damage may require eye protection.

12.5 mg/M3: Any powered air-purifying respirator with a dust and mist filter. * Substance reported to cause eye irritation or damage may require eye protection. / Any supplied-air respirator operated in a continuous flow mode. * Substance reported to cause eye irritation or damage may require eye protection.

25 mg/M3: Any air-purifying full facepiece respirator with a high-efficiency particulate filter. / Any powered air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter. * Substance reported to cause eye irritation or damage may require eye protection. / Any self-contained breathing apparatus with a full facepiece. / Any supplied-air respirator with a full facepiece.

250 mg/M3: Any supplied-air respirator with a full facepiece and operated in a pressure-demand or other positive pressure mode.

EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.: Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.

ESCAPE: Any air-purifying full facepiece respirator with a high-efficiency particulate filter. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: NIOSH

EYE: irr immed

SKIN: soap wash

INHALATION: art resp

INGESTION: water, vomit

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

----- INITIAL INCIDENT RESPONSE -----

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: ENVIRONMENTALLY HAZARDOUS SUBSTANCES, SOLID, N.O.S. (CHROMI
DOT ID NUMBER: UN3077

ERG90

GUIDE 31

* POTENTIAL HAZARDS *

*FIRE OR EXPLOSION

Some of these materials may burn, but none of them ignites readily.

*HEALTH HAZARDS

Contact may cause burns to skin and eyes.

Fire may produce irritating or poisonous gases.

Runoff from fire control or dilution water may cause pollution.

* EMERGENCY ACTION *

Keep unnecessary people away; isolate hazard area and deny entry.
Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection.
CALL CHEMTREC AT 1-800-424-9300 FOR EMERGENCY ASSISTANCE. If water pollution occurs, notify the appropriate authorities.

*FIRE

Small Fires: Dry chemical, CO2, water spray or regular foam.

Large Fires: Water spray, fog or regular foam.

Move container from fire area if you can do it without risk.

Do not scatter spilled material with high-pressure water streams.

Dike fire-control water for later disposal.

*SPILL OR LEAK

Stop leak if you can do it without risk.

Small Dry Spills: With clean shovel place material into clean, dry container and cover loosely; move containers from spill area.

Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.

Large Spills: Dike far ahead of liquid spill for later disposal.

Cover powder spill with plastic sheet or tarp to minimize spreading.

*FIRST AID

In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water.
Remove and isolate contaminated clothing and shoes at the site.

1,2-DICHLOROETHENE

CHEMTOX DATA

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----- IDENTIFIERS -----

CHEMTOX RECORD 167 LAST UPDATE OF THIS RECORD: 06/03/93
NAME: 1,2-DICHLOROETHYLENE
SYNONYMS: ACETYLENE DICHLORIDE; 1,2-DICHLOR-AETHEN (German);
DICHLORO-1,2-ETHYLENE (French); sym-DICHLOROETHYLENE;
1,2-DICHLOROETHYLENE; DIOFORM; NCI-C56031; CIS-ACETYLENE
DICHLORIDE; TRANS-ACETYLENE DICHLORIDE;
SYS-DICHLOROETHYLENE; 1,2-DICHLOROETHENE
CAS: 540-59-0 RTECS: KV9360000
FORMULA: C2H2Cl2 MOL WT: 96.94
WLN: G1U1G
CHEMICAL CLASS: Halogenated h-carbon

See other identifiers listed below under Regulations.

----- PROPERTIES -----

PHYSICAL DESCRIPTION: colorless liquid with an ether-like, slightly acrid
odor, like chloroform

BOILING POINT:	113 K	-160.2 C	-256.3 F
MELTING POINT:	255.38 K	-17.8 C	0 F
FLASH POINT:	275 K	1.85 C	35.3 F
AUTO IGNITION:	733.15 K	460 C	1351.6 F
VAPOR PRESSURE:	180 MM		
UEL:	12.8 %		
LEL:	9.7 %		
IONIZATION POTENTIAL (eV):	9.65		
VAPOR DENSITY:	3.34 (air=1)		
SPECIFIC GRAVITY:	No data		
DENSITY:	1.28g/mL		
WATER SOLUBILITY:	0.35 TO 0.63%		
INCOMPATIBILITIES:	strong oxidizers, nitrogen dioxide, solid caustic alkalies or their concentrated solutions; difluoromethylene, dehypofluoritei		

REACTIVITY WITH WATER: No data on water reactivity
REACTIVITY WITH COMMON MATERIALS: GRADUALLY DECOMPOSES BY AIR, LIGHT, AND
MOISTURE, FORMING HYDROGEN CHLORIDE
Source: MI
STABILITY DURING TRANSPORT: No Data
NEUTRALIZING AGENTS: No data
POLYMERIZATION POSSIBILITIES: WILL NOT OCCUR UNDER NORMAL SHIPPING
CONDITIONS. REACTION NOT VIGOROUS.
TOXIC FIRE GASES: None reported other than possible
unburned vapors

ODOR DETECTED AT (ppm): 0.085 PPM
ODOR DESCRIPTION: PLEASANT, ETHER-LIKE Source:NYDH
100 % ODOR DETECTION: No data

----- REGULATIONS -----

DOT hazard class: 3 FLAMMABLE LIQUID
DOT guide: 29
Identification number: UN1150
DOT shipping name: DICHLOROETHYLENE
Packing group: II
Label(s) required: FLAMMABLE LIQUID
Special provisions: T14
Packaging exceptions: 173.150
Non bulk packaging: 173.202
Bulk packaging: 173.242
Quantity limitations-
Passenger air/rail: 5 L
Cargo aircraft only: 60 L
Vessel stowage:
Other stowage provisions:

STCC NUMBER: 4909145

CLEAN WATER ACT Sect.307:No
CLEAN WATER ACT Sect.311:No
CLEAN AIR ACT: Not listed
EPA WASTE NUMBER: D001
CERCLA REF: Y
RQ DESIGNATION: Not listed
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:

Acute toxicity: Irritant
Acute toxicity: adverse effect to target organs.
Reactive hazard: unstable/reactive.
Fire hazard: flammable.

LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 1.0 percent

UNITED STATES POSTAL SERVICE MAILABILITY:

Hazard class: Flammable liquid - Mailable as ORM-D
Mailability: Domestic surface mail only
Max per parcel: 1 QT METAL; 1 PT OTHER

NFPA CODES:

HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with self-contained breathing apparatus.
FLAMMABILITY (RED) : (3) This material can be ignited under almost all temperature conditions.
REACTIVITY (YELLOW): (2) Normally unstable and readily undergoes violent change, but does not detonate.

SPECIAL

: Unspecified

----- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON -----

1,2-DICHLOROETHYLENE [540-59-0]

ACGIH TLV list "Threshold Limit Values for 1989-1990"

California Assembly Bill 1803 Well Monitoring Chemicals.

Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.

DOT Hazardous Materials Table. 49 CFR 172.101

EPA TSCA Chemical Inventory List 1989

EPA TSCA Chemical Inventory List 1990

EPA TSCA Chemical Inventory List 1992

EPA TSCA Test Submission (TSCATS) Database - April 1990

EPA TSCA Test Submission (TSCATS) Database - September 1989

Massachusetts Substance List.

New Jersey Right To Know Substance List. (December 1987)

OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.

OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992

Pennsylvania Hazardous Substance List

RCRA Hazardous Waste

SARA Section 313 Toxic Chemicals List

Washington State Discarded Chemical Products List, November 17, 1989

Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

----- TOXICITY DATA -----

SHORT TERM TOXICITY: INHALATION: may cause dizziness, drowsiness, nausea, vomiting, weakness, tremors, cramps, and at high levels unconsciousness. SKIN: may cause irritation. Eyes: may cause irritation. INGESTION: no reports of human ingestion, but may contribute to symptoms listed under inhalation.(NYDH)

LONG TERM TOXICITY: may cause dizziness, drowsiness, nausea, vomiting, weakness and inflammation of the lungs. this substance has produced kidney and liver injury at high levels in laboratory animals. whether it does so in humans is not known.(NYDH)

TARGET ORGANS: resp sys, eyes, CNS

SYMPTOMS: Inhalation causes nausea, vomiting, weakness, tremor, epigastric cramps, central nervous depression. Contact with liquid causes irritation of eyes and (on prolonged contact) skin. Ingestion causes slight depression to deep narcosis. Source: CHRIS

CONC IDLH: 4000PPM

NIOSH REL:

ACGIH TLV: TLV = 200ppm(790 mg/M3)

ACGIH STEL: STEL = 250 ppm(1,000 mg/M3)

OSHA PEL: Transitional Limits:
PEL = 200 ppm(790mg/M3)
Final Rule Limits:
TWA = 200 ppm (790 mg/M3)

MAK INFORMATION: 200 ppm
790 mg/M3
Substance with systemic effects, onset of effect less than or equal to 2 hrs: Peak = 2xMAK for 30 minutes, 4 times per shift of 8 hours.
Danger of cutaneous absorption
Carcinogenic working material without MAK

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:
IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

LD50 value: orl-rat LD50:770 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:770 mg/kg
ipr-mus LD50:2 gm/kg
ihl-frg LCLo:117 mg/m3/1H

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):

This chemical has no known mammalian reproductive toxicity.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

----- PROTECTION AND FIRST AID -----

PROTECTION SUGGESTED

FROM THE CHRIS MANUAL:

rubber gloves; safety goggles; air supply mask or self-contained breathing apparatus.

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:

Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Promptly when skin becomes wet.

** REMOVE CLOTHING:
Immediately remove any clothing that becomes wet to avoid any flammability

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (1,2-DICHLOROETHYLENE)

1000 ppm: Any powered air-purifying respirator with organic vapor cartridge(s). * Substance causes eye irritation or damage; eye protection needed. / Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s).

4000 ppm: Any supplied-air respirator operated in a continuous flow mode. * Substance causes eye irritation or damage; eye protection needed. / Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any self-contained breathing apparatus with a full facepiece. / Any supplied-air respirator with a full facepiece.

EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.: Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.

ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: CHRIS Manual 1991

INHALATION: remove from further exposure; if breathing is difficult, give oxygen; if victim is not breathing, give artificial respiration, preferably mouth-to-mouth; give oxygen when breathing is resumed; call a physician.

EYES: flush with water for at least 15 min.

SKIN: wash well with soap and water.

INGESTION: give gastric lavage and cathartics.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature.

----- INITIAL INCIDENT RESPONSE -----

FIRE EXTINGUISHMENT: Dry chemical, foam, carbon dioxide. Note: Water may be ineffective. CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).

DOT SHIPPING NAME: DICHLOROETHYLENE

DOT ID NUMBER: UN1150

ERG90

GUIDE 29

* POTENTIAL HAZARDS *

*FIRE OR EXPLOSION

Flammable/combustible material; may be ignited by heat, sparks or flames.

Vapors may travel to a source of ignition and flash back.

Container may explode in heat of fire.

Vapor explosion hazard indoors, outdoors or in sewers.

Runoff to sewer may create fire or explosion hazard.

*HEALTH HAZARDS

May be poisonous if inhaled.

Contact may cause burns to skin and eyes.

Fire may produce irritating or poisonous gases.

Runoff from fire control or dilution water may cause pollution.

* EMERGENCY ACTION *

Keep unnecessary people away; isolate hazard area and deny entry.

Stay upwind; keep out of low areas.

Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection.

Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire.

CALL CHEMTREC AT 1-800-424-9300 FOR EMERGENCY ASSISTANCE. If water pollution occurs, notify the appropriate authorities.

*FIRE

Some of these materials may react violently with water.

Small Fires: Dry chemical, CO₂, water spray or regular foam.

Large Fires: Water spray, fog or regular foam.

Move container from fire area if you can do it without risk.

Do not get water inside container.

Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks.

Withdraw immediately in case of rising sound from venting safety device or or any discoloration of tank due to fire.

*SPILL OR LEAK

Shut off ignition sources; no flares, smoking or flames in hazard area.

Do not touch or walk through spilled material; stop leak if you can do it without risk.

Use water spray to reduce vapor; do not get water inside container.

Small Spills: Take up with sand, or other noncombustible absorbent material and place into containers for later disposal.

Large Spills: Dike far ahead of spill for later disposal.

*FIRST AID

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen.

In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes.

Remove and isolate contaminated clothing and shoes at the site.

Keep victim quiet and maintain normal body temperature.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement. The COMPILERS of the CHEMTOX database shall not be held liable for inaccuracies or omissions within this database, or in any of its printed or displayed output forms.

2,4-DIMETHYLPHENOL

***** PHYSICAL DATA SUMMARY *****

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HEMTOX ID NUMBER	:	187
HEMTOX NAME	:	2,4-DIMETHYLPHENOL
AS NUMBER	:	105-67-9
FORMULA/CHEMICAL CLASS	:	C8H10O/Phenol/cresol
MOLECULAR WEIGHT	:	122.17
PHYSICAL DESCRIPTION	:	CRYSTALS; COLORLESS NEEDLES.
BOILING POINT	:	409.7 F
MELTING POINT	:	80.3 F
VAPOR PRESSURE	:	98.97 mm @144.38 C
WATER SOLUBILITY	:	SLIGHTLY SOLUBLE
SPECIFIC GRAVITY	:	1.036 @20/4 C
IONIZATION POTENTIAL	:	Not available
FLASH POINT (CC)	:	> 230 F
LEL	:	Not available
UEL	:	Not available
AUTOIGNITION TEMP	:	Not available

Sources: CHRIS Manual
and NIOSH/OSHA Guide

2=Fahrenheit, F3=Celsius (Centigrade), F4=Kelvin, F5=atm units, F6=mm units,
7=expand sp gr F8=graph vp <Return> to quit.

***** CHEMTOX REACTIVITY DATA *****

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HEMTOX RECORD	:	187
NAME	:	2,4-DIMETHYLPHENOL
AS NUMBER	:	105-67-9
FORMULA	:	C8H10O
LN	:	QR B1 D1
CHEMICAL CLASS	:	Phenol/cresol
INCOMPATIBILITIES	:	
REACTIVITY TO WATER	:	Not reactive, or unknown.
REACTIVITY WITH COMMON MATERIALS	:	No reactions of a hazardous nature.
NEUTRALIZATION	:	Not applicable.
TOXIC FIRE GASES	:	None identified, except unburned vapors.

Sources: CHRIS Manual
and NIOSH/OSHA Guide

You may see (A)nother, (Q)uit this option, or go to (O)ther options

***** PERSONNEL PROTECTION SUMMARY *****

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HEMTOX RECORD :	187	CAS NUMBER:	105-67-9
NAME :	2,4-DIMETHYLPHENOL		

NO PERSONAL PROTECTION DATA AVAILABLE FOR THIS COMPOUND. <RETURN> QUIT

IRST AID

CHEMICAL: 2,4-DIMETHYLPHENOL

SOURCE: DOT Emergency Response Guide 1990.

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation.

IRE

PILLS AND LEAKS

*SPILL OR LEAK Do not touch or walk through spilled material; stop leak if you can do it without risk. Fully-encapsulating, vapor-protective clothing should be worn for spills and leaks with no fire. Use water spray to reduce vapors. Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal. Small Dry Spills: With clean shovel place material into clean, dry container and cover; move containers from spill area. Large Spills: Dike far ahead of liquid spill for later disposal.

DI-SEC-OCTYLPHTHALATE

CHEMTOX DATA

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----- IDENTIFIERS -----

CHEMTOX RECORD 2263

LAST UPDATE OF THIS RECORD: 06/03/93

NAME: DI-SEC-OCTYL PHTHALATE
SYNONYMS: BEHP; 1,2-BENZENEDICARBOXYLIC ACID, BIS(2-ETHYLHEXYL)
ESTER; BIS(2-ETHYLHEXYL)-1,2-BENZENEDICARBOXYLATE;
BIS(2-ETHYLHEXYL)PHTHALATE; BISOFLEX 81; BISOFLEX DOP;
COMPOUND 889; DAF 68; DEHP;
DI(2-ETHYLHEXYL)ORTHOPHTHALATE; DI(2-ETHYLHEXYL)PHTHALATE;
DIOCTYL PHTHALATE; DI-sec-OCTYL PHTHALATE; DOP; ERGOPLAST
FDO; ETHYLHEXYL PHTHALATE; 2-ETHYLHEXYL PHTHALATE;
EVIPLAST 80; EVIPLAST 81; FLEXIMEL; FLEXOL DOP; FLEXOL
PLASTICIZER DOP; GOOD-RITE GP 264; HATCOL DOP; HERCOFLEX
260; KODAFLEX DOP; MOLLAN O; NCI-C52733; NUOPLAZ DOP;
OCTOIL; OCTYL PHTHALATE; PALATINOL AH; PHTHALIC ACID
DIOCTYL ESTER; PITTSBURGH PX-138; PLATINOL AH; PLATINOL
DOP; RC PLASTICIZER DOP; REOMOL DOP; REOMOL D 79P; SICOL
150; STAFLEX DOP; TRUFLEX DOP; VESTINOL AH; VINICIZER 80;
WITCIZER 312; BIS-(2-ETHYLHEXYL) PHTHALATE;
DI-(2-ETHYLHEXYL) PHTHALATE; 1,2-BENZENE DICARBOXYLIC
ACID,[BIS(2-ETHYLHEXYL)] ESTER; PHTHALIC ACID,
BIS(2-ETHYLHEXYL)ESTER; BIS(2-ETHYLHEXYL) PHTHALATE;
PHTHALIC ACID, BIS(2-ETHYLHEXYL) ESTER;
O-BENZENEDICARBOXYLIC ACID, DIOCTYL ESTER; DIOCTYL
O-BENZENEDICARBOXYLATE; ETHYLHEXYL PHTHALATE; CELLUFLEX
DOP; FLEXOL DO[; POLYCIZER 162; PX-138; UNION CARBIDE
FLEXOL 380; DI-2-ETHYLHEXYLPHTHALATE
CAS: 117-81-7 RTECS: TI0350000
FORMULA: C24H38O4 MOL WT: 390.62
WLN: 4Y2
CHEMICAL CLASS:Ester

See other identifiers listed below under Regulations.

----- PROPERTIES -----

PHYSICAL DESCRIPTION: clear, colorless, oily liquid with almost no odor
BOILING POINT: 659.26 K 386.1 C 726.9 F
MELTING POINT: 227.04 K -46.2 C -51 F
FLASH POINT: 491 K 217.85 C 424.1 F
AUTO IGNITION: 663.7 K 390.5 C 1226.6 F
VAPOR PRESSURE: <.01 mm Hg @ 200 C
UEL: NA
LEL: 0.3 @ 474 F
VAPOR DENSITY: 16.0 (air=1)
EVAPORATION RATE: <0.005(n-BUTYL ACETATE=1)
SPECIFIC GRAVITY: 0.9861 @ 20 C
DENSITY: 0.986 g/mL @ 20 C
WATER SOLUBILITY: 0.005%

INCOMPATIBILITIES: nitrates, strong oxidizers, strong acids, strong alkalies

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: CAN REACT WITH OXIIZING MATERIALS; HYDROLYZES UNDER ACID OR BASIC CONDITIONS Source: CSDS

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: ACRID SMOKE

ODOR DETECTED AT (ppm): Unknown

ODOR DESCRIPTION: No data

100 % ODOR DETECTION: No data

----- REGULATIONS -----

DOT hazard class: 9 CLASS 9

DOT guide: 31

Identification number: UN3082

DOT shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCES, LIQUID, N.O.S. (DI-SEC-OCTYL PHTHALATE)

Packing group: III

Label(s) required: CLASS 9

Special provisions: 8, T1

Packaging exceptions: 173.155

Non bulk packaging: 173.203

Bulk packaging: 173.241

Quantity limitations-

Passenger air/rail: NONE

Cargo aircraft only: NONE

Vessel stowage: A

Other stowage provisions:

STCC NUMBER: Not listed

CLEAN WATER ACT Sect.307:Yes

CLEAN WATER ACT Sect.311:No

National Primary Drinking Water Regulations

Maximum Contaminant Levels (MCL): 0.006 mg/L (01/17/94)

Maximum Contaminant Level Goals (MCLG): 0 mg/L (01/17/94)

CLEAN AIR ACT: CAA '90 Listed

EPA WASTE NUMBER: U028

CERCLA REF: Y

RQ DESIGNATION: B 100 pounds (45.4 kg) CERCLA

SARA TPQ VALUE: Not listed

SARA Sect. 312

categories:

Acute toxicity: Irritant

Acute toxicity: adverse effect to target organs.

Chronic toxicity: carcinogen

Chronic toxicity: mutagen.
Chronic toxicity: reproductive toxin.
LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 0.1 percent

UNITED STATES POSTAL SERVICE MAILABILITY:
Not given

NFPA CODES:

HEALTH HAZARD (BLUE): (0) No unusual health hazard.
FLAMMABILITY (RED): (1) This material must be preheated before ignition
can occur.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

----- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON -----

ACGIH TLV list "Threshold Limit Values for 1989-1990"
California Assembly Bill 1803 Well Monitoring Chemicals.
California Assembly Bill 2588 Air Toxics "Hot Spots" Chemicals.
California Assembly Bill 1807 Toxic Air Contaminants.
California Proposition 65 Carcinogen List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act of November 15, 1990. List of pollutants.
Clean Water Act Section 307 Priority Pollutants
DI-SEC-OCTYL PHTHALATE [117-81-7]
DOT Hazardous Materials Table. 49 CFR 172.101
EPA TSCA 8(a) Preliminary Assessment Information Rule - effective 11/19/82
EPA TSCA 8(d) Health and Safety Data Rule - effective date 10/04/82
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Section 12(b) Export Rule Notification.
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
National Toxicology Program list of anticipated human carcinogens
New Jersey Right To Know Substance List. (December 1987)
New Jersey Right to Know Substance List. Listed as a carcinogen.
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
Pennsylvania Hazardous Substance List
RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264
RCRA Hazardous Waste
SARA Section 313 Toxic Chemicals List
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
Washington State Discarded Chemical Products List, November 17, 1989
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

----- TOXICITY DATA -----

SHORT TERM TOXICITY: Unknown

LONG TERM TOXICITY: unknown

TARGET ORGANS: git, skin, eyes.

SYMPTOMS: IRRIT EYES, MUC MEMBRANE, NAU, DIARR. LOCAL IRRITATION
OF SKIN, EYES, MUCOUS MEMBRANES, AND BRONCHIA,
STAGGERING, NAUSEA AND CNS DEPRESSION. Source: CSDS

CONC IDLH: Unknown

NIOSH REL: Potential occupational carcinogen (LOQ 0.15 mg/M3)
REDUCE EXPOSURE TO LOWEST FEASIBLE LIMIT

ACGIH TLV: TLV = 5mg/M3
ACGIH STEL: STEL = 10 mg/M3

OSHA PEL: Transitional Limits:
PEL = 5mg/M3
Final Rule Limits:
TWA = 5 mg/M3
STEL = 10 mg/M3

MAK INFORMATION: 10 calculated as total dust mg/M3
Substance with systemic effects, onset of effect over
2 hours: Peak = 10xMAK for 30 minutes, once per shift
of 8 hours.
There is no reason to fear a risk of damage to the
developing embryo or fetus when MAK values are adhered
to.

CARCINOGEN?: Y STATUS: See below
REFERENCES:

ANIMAL POSITIVE IARC** 28,151,82
ANIMAL POSITIVE IARC** 29,269,82
HUMAN INDEFINITE IARC** 29,269,82

CARCINOGEN LISTS:

IARC: Carcinogen defined by IARC
to be possibly carcinogenic to
humans, but having (usually) no
human evidence.
MAK: Not listed
NIOSH: Carcinogen defined by NIOSH
with no further categorization.
NTP: Carcinogen defined by NTP as
reasonably anticipated to be
carcinogenic, with limited
evidence in humans or sufficient
evidence in experimental animals.
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)

orl-man TDLo:143 mg/kg JIHTAB 27,130,45
GASTROINTESTINAL
Other changes

LD50 value: orl-rat LD50:30600 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:30600 mg/kg
skn-rat LDLo:4 gm/kg
ipr-rat LD50:30700 mg/kg
ivn-rat LD50:250 mg/kg
orl-mus LD50:30 gm/kg
skn-mus LDLo:4 gm/kg
ipr-mus LD50:14 gm/kg
ivn-mus LD50:1060 mg/kg
orl-rbt LD50:34 gm/kg
skn-rbt LD50:25 gm/kg
orl-gpg LD50:26 gm/kg
skn-gpg LD50:10 gm/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

skn-rbt 500 mg/24H MLD
eye-rbt 500 mg
eye-rbt 500 mg/24H MLD

Reproductive toxicity (1992 RTECS):

This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

orl-rat TDLo:7140 mg/kg (1-21D preg) TXAPA9 26,253,73
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

orl-rat TDLo:35 mg/kg (14D pre) FCTXAV 15,389,77
MATERNAL EFFECTS
Ovaries,fallopian tubes

orl-rat TDLo:6 gm/kg (3D male) ARTODN 59,290,86
PATERNAL EFFECTS
Testes,epididymis,sperm duct
PATERNAL EFFECTS
Prostate,seminal vessel,Cowper's gland,accessory
glands,urethra

orl-rat TDLo:17200 mg/kg (multigenerations) NEZAAQ
31,507,76
EFFECTS ON FERTILITY
Post-implantation mortality

orl-rat TDLo:10 gm/kg (6-15D preg) IJEBA6 27,885,89

EFFECTS ON EMBRYO OR FETUS
 Fetotoxicity(except death,e.g.,stunted fetus)
 EFFECTS ON EMBRYO OR FETUS
 Other effects on embryo or fetus
 SPECIFIC DEVELOPMENTAL ABNORMALITIES
 Hapatobiliary system

orl-rat TDLo:9766 mg/kg (12D preg) TJADAB 35,41,87
 SPECIFIC DEVELOPMENTAL ABNORMALITIES
 Musculoskeletal system
 SPECIFIC DEVELOPMENTAL ABNORMALITIES
 Cardiovascular(circulatory)system
 SPECIFIC DEVELOPMENTAL ABNORMALITIES
 Urogenital system

ipr-rat TDLo:6 gm/kg (3-9D preg) JDSCAE 55,696,72
 EFFECTS ON FERTILITY
 Pre-implantation mortility

ipr-rat TDLo:10 gm/kg (5-15D preg) JPMSAE 61,51,72
 EFFECTS ON FERTILITY
 Post-implantation mortality
 SPECIFIC DEVELOPMENTAL ABNORMALITIES
 Eye,ear
 SPECIFIC DEVELOPMENTAL ABNORMALITIES
 Other developmental abnormalities

ipr-rat TDLo:5 gm/kg (5-15D preg) JPMSAE 61,51,72
 EFFECTS ON EMBRYO OR FETUS
 Fetotoxicity(except death,e.g.,stunted fetus)

ipr-rat TDLo:1 gm/kg (10D male) TXAPA9 62,121,82
 PATERNAL EFFECTS
 Other effects on male

ipr-rat TDLo:6 gm/kg (3-9D preg) EVHPAZ 3,91,73
 MATERNAL EFFECTS
 Parturition
 EFFECTS ON FERTILITY
 Pre-implantation mortility

orl-mus TDLo:78880 mg/kg (6-13D preg) TCMUD8 7,29,87
 EFFECTS ON FERTILITY
 Litter size(# fetuses per litter;measured before birth)

orl-mus TDLo:4200 mg/kg (21D male) OKEHDW 15,129,77
 PATERNAL EFFECTS
 Spermatogenesis

orl-mus TDLo:50 mg/kg (7D preg) EVHPAZ 45,71,82
 EFFECTS ON EMBRYO OR FETUS
 Fetotoxicity(except death,e.g.,stunted fetus)

orl-mus TDLo:1 gm/kg (7D preg) EVHPAZ 45,71,82
 EFFECTS ON EMBRYO OR FETUS
 Fetal death
 SPECIFIC DEVELOPMENTAL ABNORMALITIES
 Musculoskeletal system

orl-mus TDLo:2040 mg/kg (1-17D preg) NTIS** PB85-105674
 EFFECTS ON FERTILITY
 Post-implantation mortality
 EFFECTS ON FERTILITY
 Litter size(# fetuses per litter;measured before birth)
 EFFECTS ON EMBRYO OR FETUS
 Fetal death

orl-mus TDLo:2040 mg/kg (1-17D preg) TJADAB 27,84A,83
 SPECIFIC DEVELOPMENTAL ABNORMALITIES
 Central nervous system
 SPECIFIC DEVELOPMENTAL ABNORMALITIES
 Eye,ear
 SPECIFIC DEVELOPMENTAL ABNORMALITIES
 Cardiovascular(circulatory)system

ipr-mus TDLo:30 gm/kg (5D male) EVHPAZ 65,255,86
 PATERNAL EFFECTS
 Spermatogenesis
 PATERNAL EFFECTS
 Testes,epididymis,sperm duct

ipr-mus TDLo:25560 mg/kg (1D male) EVHPAZ 3,81,73
 EFFECTS ON FERTILITY
 Pre-implantation mortility
 EFFECTS ON FERTILITY
 Litter size(# fetuses per litter;measured before birth)

ipr-mus TDLo:12780 mg/kg (1D male) EVHPAZ 3,81,73
 EFFECTS ON EMBRYO OR FETUS
 Fetal death

ipr-mus TDLo:12780 ug/kg (1D male) TXAPA9 29,35,74
 EFFECTS ON FERTILITY
 Male fertility index

ipr-mus TDLo:24 gm/kg (7-9D preg) ARTODN 56,263,85
 EFFECTS ON FERTILITY
 Abortion

scu-mus TDLo:2970 mg/kg (3D male) JTEHD6 16,71,85
 EFFECTS ON FERTILITY
 Pre-implantation mortility
 EFFECTS ON EMBRYO OR FETUS

Fetal death

scu-mus TDLo:19722 mg/kg (3D male) JTEHD6 26,39,89

PATERNAL EFFECTS

Testes,epididymis,sperm duct

EFFECTS ON FERTILITY

Male fertility index

scu-mus TDLo:1972 mg/kg (3D male) JTEHD6 26,39,89

PATERNAL EFFECTS

Other effects on male

scu-mus TDLo:9861 mg/kg (3D pre) JTEHD6 26,39,89

MATERNAL EFFECTS

Other effects on female

ivn-mus TDLo:50 mg/kg (1D pre) NTIS** PB250-102

EFFECTS ON FERTILITY

Female fertility index

ivn-mus TDLo:350 mg/kg (7D male) NTIS** PB250-102

EFFECTS ON FERTILITY

Litter size(# fetuses per litter;measured before birth)

ivn-mus TDLo:15 mg/kg (3-5D preg) NTIS** PB250-102

EFFECTS ON EMBRYO OR FETUS

Fetotoxicity(except death,e.g.,stunted fetus)

ivn-mus TDLo:5 mg/kg (8D preg) NTIS** PB250-102

EFFECTS ON FERTILITY

Other measures of fertility

orl-gpg TDLo:20 gm/kg (10D male) EVHPAZ 45,77,82

PATERNAL EFFECTS

Testes,epididymis,sperm duct

orl-mam TDLo:20 gm/kg (10D male) EVHPAZ 45,77,82

PATERNAL EFFECTS

Testes,epididymis,sperm duct

NO SIGNIFICANT

RISK LEVEL(Ca P65): 80 micrograms/day

----- EPA's IRIS DATA SUMMARY -----
Di(2-ethylhexyl)phthalate (DEHP); CASRN 117-81-7 (04/01/92)

_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Di(2-ethylhexyl)phthalate (DEHP)

CASRN -- 117-81-7

Primary Synonym -- Bis(2-ethylhexyl)phthalate

Last Revised -- 08/01/91

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- B2; probable human carcinogen.

Basis -- Orally administered DEHP produced significant dose-related increases in liver tumor responses in rats and mice of both sexes.

II.A.2. HUMAN CARCINOGENICITY DATA

Inadequate. Thiess et al. (1978) conducted a mortality study of 221 DEHP production workers exposed to unknown concentrations of DEHP for 3 months to 24 years. Workers were followed for a minimum of 5 to 10 years (mean follow-up time was 11.5 years). Eight deaths were reported in the exposed population. Deaths attributable to pancreatic carcinoma (1 case) and uremia (1 case in which the workers also had urethral and bladder papillomas) were significantly elevated in workers exposed for >15 years when compared to the corresponding age groups in the general population. The study is limited by a short follow-up period and unquantified worker exposure. Results are considered inadequate for evidence of a causal association.

II.A.3. ANIMAL CARCINOGENICITY DATA

Sufficient. In an NTP (1982) study, 50 male and 50 female Fisher 344 rats per group were fed diets containing 0, 6000 or 12,000 ppm DEHP for 103 weeks. Similarly, groups of 50 male and 50 female B6C3F1 mice were given 0, 3000 or 6000 ppm DEHP in the diet for 103 weeks. Animals were killed and examined histologically when moribund or after 105 weeks. No clinical signs of toxicity were observed in either rats or mice. A statistically significant increase in

the incidence of hepatocellular carcinomas and combined incidence of carcinomas and adenoma were observed in female rats and both sexes of mice. The combined incidence of neoplastic nodules and hepatocellular carcinomas was statistically significantly increased in the high-dose male rats. A positive dose response trend was also noted.

Carpenter et al. (1953) found no malignant tumors in treated groups of 32 male and 32 female Sherman rats. Animals were given 400, 1300 or 4000 ppm DEHP in the diet for 1 year and reduced to a maximum of 8 males and 8 females and treated for another year. Controls, F1 and 4000 ppm groups were sacrificed after being maintained on control or 4000 ppm diets for 1 year. Only 40 to 47% of the animals in each group, including F1 animals, survived 1 year. Thus, an insufficient number of animals were available for a lifetime evaluation.

Carpenter et al. (1953) did not find a carcinogenic effect in guinea pigs and dogs exposed to 1300 or 4000 ppm DEHP. Both guinea pigs and dogs were terminated after 1 year of exposure. The treatment and survival periods for these animals were considerably below their lifetimes.

II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

Studies indicate that DEHP is not a direct acting mutagen in either a forward mutation assay in *Salmonella typhimurium* (Seed, 1982) or the rec assay in *Bacillus subtilis* (Tomita et al., 1982). DEHP did not induce mutations in a modified reverse mutation plate incorporation assay in *Salmonella* strains TA100 and TA98 at concentrations up to 1000 ug/plate in the presence or absence of S9 hepatic homogenate (Kozumbo et al., 1982). MEHP, the monoester form of DEHP and a metabolite is positive in the rec assay and in the reverse mutation assay in *Salmonella*. In the absence of exogenous metabolism MEHP produced chromosomal aberrations and sister chromatid exchanges in V79 cells. Both DEHP and MEHP induced chromosomal aberrations and morphological transformation in cultured fetal Syrian hamster cells exposed in utero (Tomita et al., 1982). Chromosomal effects were not found in CHO mammalian cells (Phillips et al., 1982) exposed to DEHP. DEHP was weakly positive with metabolic activation in only one of several studies testing for mutagenic activity at the thymidine kinase locus in L5178Y mouse lymphoma cells (Ashby et al., 1985). DEHP is a potent inducer of hepatic peroxisomal enzyme activity (Ganning et al., 1984).

II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

II.B.1. SUMMARY OF RISK ESTIMATES

Oral Slope Factor -- $1.4E-2/\text{mg/kg/day}$

Drinking Water Unit Risk -- $4.0E-7/\text{ug/L}$

Extrapolation Method -- Linearized multistage procedure, extra risk

Drinking Water Concentrations at Specified Risk Levels:

Risk Level	Concentration
-----	-----
E-4 (1 in 10,000)	$3E+2$ ug/L
E-5 (1 in 100,000)	$3E+1$ ug/L
E-6 (1 in 1,000,000)	3 ug/L

___II.B.2. DOSE-RESPONSE DATA (CARCINOGENICITY, ORAL EXPOSURE)

Tumor Type -- Mouse/B6C3F1, male

Test Animals -- hepatocellular carcinoma and adenoma

Route -- diet

Reference -- NTP, 1982

----- Dose -----		
Admin- istered (ppm)	Human Equivalent (mg/kg)/day	Tumor Incidence
-----	-----	-----
0	0	14/50
3000	32	25/48
6000	65	29/50

___II.B.3. ADDITIONAL COMMENTS (CARCINOGENICITY, ORAL EXPOSURE)

In this study powdered rodent meal was provided in such a way that measured food consumption could include significant waste and spillage rather than true food intake. For this reason a standard food consumption rate of 13% mouse body weight was used in the dose conversion.

DEHP is hydrolyzed to monoesters including MEHP (Pollack et al., 1985; Lhuguenot et al., 1985; Kluwe, 1982). Although several species of animals have been determined to excrete glucuronide conjugates of monoethylhexyl phthalate (MEHP) upon exposure to DEHP, rats do not (Tanaka et al., 1975; Williams and Blanchfield, 1975; Albro et al., 1982).

Slope factors based on combined hepatocellular carcinoma and neoplastic nodule incidences were $4.5E-3/\text{mg/kg/day}$ for female rats, $3.2E-3/\text{mg/kg/day}$ for male rats. A slope factor based on hepatocellular adenomas or carcinomas in female mice is $1.0E-2/\text{mg/kg/day}$.

The unit risk should not be used if the water concentration exceeds $4E+4$ ug/L, since above this concentration the slope factor may differ from that stated.

___II.B.4. DISCUSSION OF CONFIDENCE (CARCINOGENICITY, ORAL EXPOSURE)

An adequate number of animals was observed and a statistically significant increase in incidence of liver tumors was seen in both sexes and were dose dependent in both sexes of mice and female rats. A potential source of variability in the NTP study is the possibility of feed scattering. The above calculations are based on standard food consumption rates for mice (13% of body weight) and rats (5% of body weight).

___II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

Not available.

___II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

___II.D.1. EPA DOCUMENTATION

U.S. EPA. 1988. Drinking Water Criteria Document for Phthalic Acid Esters. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Drinking Water, Washington, DC. (External Review Draft).

___II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The values in the 1988 Drinking Water Criteria Document for Phthalic Acid Esters (External Review Draft) have received Agency review.

Agency Work Group Review: 08/26/87; 10/07/87

Verification Date: 10/07/87

___II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

Welford C. Roberts / ODW -- (202)260-7589 / FTS 260-7589

Lynn Papa / ORD -- (513)569-7523 / FTS 684-7523

----- PROTECTION AND FIRST AID -----

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (DI-SEC-OCTYL PHTHALATE)
Greater at any detectable concentration. : Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator with a high-efficiency particulate filter. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: NIOSH
wash regularly
EYE: None given
SKIN: None given
INHALATION: None given
INGESTION: None given

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

----- INITIAL INCIDENT RESPONSE -----

FIRE EXTINGUISHMENT: WATER OR FOAM MAY CAUSE FROTHING IN FIRES. Note:
CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: ENVIRONMENTALLY HAZARDOUS SUBSTANCES, LIQUID, N.O.S. (DI-SEC
DOT ID NUMBER: UN3082

ERG90

GUIDE 31

* POTENTIAL HAZARDS *

*FIRE OR EXPLOSION

Some of these materials may burn, but none of them ignites readily.

*HEALTH HAZARDS

Contact may cause burns to skin and eyes.

Fire may produce irritating or poisonous gases.

Runoff from fire control or dilution water may cause pollution.

* EMERGENCY ACTION *

Keep unnecessary people away; isolate hazard area and deny entry. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. CALL CHEMTREC AT 1-800-424-9300 FOR EMERGENCY ASSISTANCE. If water pollution occurs, notify the appropriate authorities.

***FIRE**

Small Fires: Dry chemical, CO₂, water spray or regular foam.

Large Fires: Water spray, fog or regular foam.

Move container from fire area if you can do it without risk.

Do not scatter spilled material with high-pressure water streams.

Dike fire-control water for later disposal.

***SPILL OR LEAK**

Stop leak if you can do it without risk.

Small Dry Spills: With clean shovel place material into clean, dry container and cover loosely; move containers from spill area.

Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.

Large Spills: Dike far ahead of liquid spill for later disposal.

Cover powder spill with plastic sheet or tarp to minimize spreading.

***FIRST AID**

In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water.

Remove and isolate contaminated clothing and shoes at the site.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement. The COMPILERS of the CHEMTOX database shall not be held liable for inaccuracies or omissions within this database, or in any of its printed or displayed output forms.

ETHYL BENZENE

CHEMTOX DATA

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----- IDENTIFIERS -----

CHEMTOX RECORD 206

LAST UPDATE OF THIS RECORD: 06/03/93

NAME: ETHYL BENZENE

SYNONYMS: AETHYLBENZOL (German); EB; ETHYLBENZEEN (Dutch); ETHYL
BENZENE; ETHYL BENZENE (DOT); ETHYLBENZOL; ETILBENZENE
(Italian); ETYLOBENZEN (Polish); NCI-C56393; PHENYLETHANE

CAS: 100-41-4

RTECS: DA0700000

FORMULA: C8H10

MOL WT: 106.18

WLN: 2R

CHEMICAL CLASS: Aromatic hydrocarbon

See other identifiers listed below under Regulations.

----- PROPERTIES -----

PHYSICAL DESCRIPTION: colorless liquid with a sweet, gasoline-like odor.

BOILING POINT: 409.2 K 136 C 276.8 F

MELTING POINT: 178.15 K -95 C -139 F

FLASH POINT: 294.26 K 21.11 C 69.9 F

AUTO IGNITION: 733 K 459.8 C 1351.4 F

CRITICAL TEMP: 617.1 K 343.95 C 651.11 F

CRITICAL PRESS: 3.61 kN/M2 35.5 atm 523 psia

HEAT OF VAP: 144 Btu/lb 79.97 cal/g 3.346x E5 J/kg

HEAT OF COMB: -17780 Btu/lb -9885 cal/g -413x E5 J/kg

VAPOR PRESSURE: 10mm @ 25.9 C

UEL: 6.7 %

LEL: 1.0 %

IONIZATION POTENTIAL (eV): 8.76

VAPOR DENSITY: 3.7 (air=1)

EVAPORATION RATE: 0.84 (n-BUTYL ACETATE=1)

SPECIFIC GRAVITY: 0.867 20C

DENSITY: 0.866 g/mL @ 20 C

WATER SOLUBILITY: 0.015%

INCOMPATIBILITIES: strong oxidizers

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: OXIDIZING MATERIALS Source: SAX

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible
unburned vapors

ODOR DETECTED AT (ppm): 140

ODOR DESCRIPTION: AROMATIC Source: CHRIS

100 % ODOR DETECTION: No data

----- REGULATIONS -----

DOT hazard class: 3 FLAMMABLE LIQUID
DOT guide: 26
Identification number: UN1175
DOT shipping name: Ethylbenzene
Packing group: II
Label(s) required: FLAMMABLE LIQUID
Special provisions: T1
Packaging exceptions: 173.150
Non bulk packaging: 173.202
Bulk packaging: 173.242
Quantity limitations-
Passenger air/rail: 5 L
Cargo aircraft only: 60 L
Vessel stowage: B
Other stowage provisions:

STCC NUMBER: 4909163

CLEAN WATER ACT Sect.307:Yes

CLEAN WATER ACT Sect.311:Yes

National Primary Drinking Water Regulations

Maximum Contaminant Levels (MCL): 0.7 mg/L (07/30/92)

Maximum Contaminant Level Goals (MCLG): 0.7 mg/L (07/30/92)

CLEAN AIR ACT: CAA '90 Listed

EPA WASTE NUMBER: D001

CERCLA REF: Y

RQ DESIGNATION: C 1000 pounds (454 kg) CERCLA

SARA TPQ VALUE: Not listed

SARA Sect. 312
categories:

Acute toxicity: Irritant

Acute toxicity: adverse effect to target organs.

Chronic toxicity: mutagen.

Chronic toxicity: reproductive toxin.

Fire hazard: flammable.

LISTED IN SARA Sect 313: Yes

de minimus CONCENTRATION: 1.0 percent

UNITED STATES POSTAL SERVICE MAILABILITY:

Hazard class: Flammable liquid - Mailable as ORM-D

Mailability: Domestic surface mail only

Max per parcel: 1 QT METAL; 1 PT OTHER

NFPA CODES:

HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with self-contained breathing apparatus.

FLAMMABILITY (RED) : (3) This material can be ignited under almost all temperature conditions.

REACTIVITY (YELLOW): (0) Stable even under fire conditions.

SPECIAL : Unspecified

----- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON -----

ACGIH TLV list "Threshold Limit Values for 1989-1990"
California Assembly Bill 1803 Well Monitoring Chemicals.
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 111 List.
Clean Air Act of November 15, 1990. List of pollutants.
Clean Water Act Section 307 Priority Pollutants
Clean Water Act Section 311 Hazardous Chemicals List.
DOT Hazardous Materials Table. 49 CFR 172.101
EPA Carcinogen Assessment Group List
EPA TSCA 8(a) Preliminary Assessment Information Rule - effective 11/19/82
EPA TSCA 8(d) Health and Safety Data Rule - effective date 06/19/87
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
ETHYL BENZENE [100-41-4]
Massachusetts Substance List.
New Jersey DEQ100 list for release reporting.
New Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992
Pennsylvania Hazardous Substance List
RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264
RCRA Hazardous Waste
SARA Section 313 Toxic Chemicals List
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

----- TOXICITY DATA -----

SHORT TERM TOXICITY: INHALATION: 200 ppm for 30 minutes can cause irritation of the nose and throat, dizziness, difficult breathing and depression. very high levels can cause unconsciousness. SKIN: can cause irritation, inflammation, blisters and burns. Eyes: 200 ppm can cause irritation. higher levels can cause burning, tearing and injury. INGESTION: can cause headache, sleepiness and coma.(NYDH)

LONG TERM TOXICITY: may cause skin rash and irritation of eyes, nose and throat.(NYDH)

TARGET ORGANS: eyes, upper resp sys, skin, CNS

SYMPTOMS: Inhalation may cause irritation of nose, dizziness, depression. Moderate irritation of eye with corneal injury possible. Irritates skin and may cause blisters. Source: CHRIS

CONC IDLH: 2000PPM

NIOSH REL:

ACGIH TLV: TLV = 100ppm(435 mg/M3)
ACGIH STEL: STEL = 125 ppm(545 mg/M3)

OSHA PEL: Transitional Limits:
PEL = 100 ppm(435mg/M3)
Final Rule Limits:
TWA = 100 ppm (435 mg/M3)
STEL = 125 ppm(545 mg/M3)

MAK INFORMATION: 100 ppm
440 mg/M3
Local irritant: Peak = 2xMAK for 5 minutes, 8 times
per shift.
Danger of cutaneous absorption

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:

IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)
ihl-hmn TCLo:100 ppm/8H AIHAAP 31,206,70
SENSE ORGANS
Eye
Other
BEHAVIORAL
Sleep
LUNGS, THORAX, OR RESPIRATION
Other changes

LD50 value: orl-rat LD50:3500 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:3500 mg/kg
ihl-rat LCLo:4000 ppm/4H
ihl-mus LDLo:50 gm/m3/2H
ipr-mus LD50:2272 mg/kg
skn-rbt LD50:17800 mg/kg
ihl-gpg LCLo:10000 ppm

IRRITATION DATA: (Source: NIOSH RTECS 1992)

skn-rbt 15 mg/24H open MLD
eye-rbt 100 mg

Reproductive toxicity (1992 RTECS):

This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

ihl-rat TCLo:97 ppm/7H (15D pre) NTIS** PB83-208074
EFFECTS ON FERTILITY
Female fertility index

ihl-rat TCLo:985 ppm/7H (1-19D preg) NTIS** PB83-208074
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

ihl-rat TCLo:96 ppm/7H (1-19D preg) NTIS** PB83-208074
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rat TCLo:600 mg/m3/24H (7-15D preg) ATSUDG 8,425,85
EFFECTS ON FERTILITY
Post-implantation mortality
EFFECTS ON EMBRYO OR FETUS
Fetal death
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rat TCLo:2400 mg/m3/24H (7-15D preg) ATSUDG
8,425,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

ihl-rbt TCLo:99 ppm/7H (1-18D preg) NTIS** PB83-208074
EFFECTS ON FERTILITY
Litter size(# fetuses per litter;measured before
birth)

ihl-rbt TCLo:500 mg/m3/24H (7-20D preg) ATSUDG 8,425,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

----- EPA's IRIS DATA SUMMARY -----
Ethylbenzene; CASRN 100-41-4 (04/01/92)

_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Ethylbenzene
CASRN -- 100-41-4
Last Revised -- 08/01/91

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure.

The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- D; not classifiable as to human carcinogenicity.

Basis -- nonclassifiable due to lack of animal bioassays and human studies.

II.A.2. HUMAN CARCINOGENICITY DATA

None.

II.A.3. ANIMAL CARCINOGENICITY DATA

None. NTP has plans to initiate bioassay. Metabolism and excretion studies at 3.5, 35 and 350 mg/kg are to be conducted as well.

II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

The metabolic pathways for humans and rodents are different (Engstrom et al., 1984). Major metabolites in humans, mandelic acid and phenylglyoxylic acid, are minor metabolites in rats and rabbits (Kiese and Lenk, 1974). The major animal metabolites were not detected in the urine of exposed workers (Engstrom et al., 1984).

Ethylbenzene at 0.4 mg/plate was not mutagenic for Salmonella strains TA98, TA1535, TA1537 and TA1538 with or without Aroclor 1254 induced rat liver homogenates (S9) (Nestmann et al., 1980). Ethylbenzene was shown to increase the mean number of sister chromatid exchanges in human whole blood lymphocyte culture at the highest dose examined without any metabolic activation system (Norppa and Vainio, 1983).

Dean et al. (1985) used a battery of short-term tests including bacterial

mutation assays, mitotic gene conversion in *Saccharomyces cerevisiae* JD1 in the presence and absence of S9 and chromosomal damage in a cultured rat liver cell line. Ethylbenzene was not mutagenic in the range of concentrations tested (0.2, 2, 20, 50 and 200 ug/plate) for *S. typhimurium* TA98, TA100, TA1535, TA1537 and TA1538 or for *Escherichia coli* WP2 and WP2uvrA. Ethylbenzene also showed no response in the *S. cerevisiae* JD1 gene conversion assay. In contrast, ethylbenzene hydroperoxide showed positive responses with *E. coli* WP2 at 200 ug/plate in the presence of S9 and an equally significant response with the gene conversion system of yeast.

__II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

Not available.

__II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

Not available.

__II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

__II.D.1. EPA DOCUMENTATION

U.S. EPA. 1980. Ambient Water Quality Criteria Document for Ethylbenzene. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Water Regulations and Standards, Washington, DC. EPA 440/5-80-048. NTIS PB 81-117590.

U.S. EPA. 1984. Health Effects Assessment for Ethylbenzene. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Emergency and Remedial Response, Washington, DC. EPA/540/1-86/008.

U.S. EPA. 1987. Drinking Water Criteria Document for Ethylbenzene. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Drinking Water, Washington, DC.

___II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The Ambient Water Quality Criteria Document and the Health Assessment Document have received Agency and external review. The Drinking Water Criteria Document has been extensively reviewed.

Agency Work Group Review: 10/07/87

Verification Date: 10/07/87

___II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

Arthur S. Chiu / ORD -- (202)260-6764 / FTS 260-6764

Lynn Papa / ORD -- (513)569-7523 / FTS 684-7523

----- PROTECTION AND FIRST AID -----

PROTECTION SUGGESTED

FROM THE CHRIS MANUAL:

self-contained breathing apparatus; safety goggles.

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Promptly when skin becomes contaminated.

** REMOVE CLOTHING:
Immediately remove any clothing that becomes wet to avoid any flammability

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (ETHYL BENZENE)

1000 ppm: Any powered air-purifying respirator with organic vapor cartridge(s). * Substance reported to cause eye irritation or damage may require eye protection. / Any supplied-air respirator. * Substance reported to cause eye irritation or damage may require eye protection. / Any self-contained breathing apparatus. * Substance reported to cause eye irritation or damage may require eye protection. / Any chemical cartridge respirator with organic vapor cartridge(s). * Substance reported to cause

eye irritation or damage may require eye protection.

2000 ppm: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any supplied-air respirator with a full facepiece. / Any self-contained breathing apparatus with a full facepiece.

EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.:

Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.

ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: CHRIS Manual 1991

INHALATION: if ill effects occur, remove victim to fresh air, keep him warm and quiet, and get medical help promptly; if breathing stops, give artificial respiration.

INGESTION: induce vomiting only upon physician's approval; material in lung may cause chemical pneumonitis.

SKIN AND

EYES: promptly flush with plenty of water (15 min. for eyes) and get medical attention; remove and wash contaminated clothing before reuse.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

----- INITIAL INCIDENT RESPONSE -----

FIRE EXTINGUISHMENT: Foam (most effective), water fog, carbon dioxide or dry chemical. CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).

DOT SHIPPING NAME: Ethylbenzene

DOT ID NUMBER: UN1175

ERG90

GUIDE 26

* POTENTIAL HAZARDS *

*FIRE OR EXPLOSION

Flammable/combustible material; may be ignited by heat, sparks or flames.

Vapors may travel to a source of ignition and flash back.

Container may explode in heat of fire.

Vapor explosion hazard indoors, outdoors or in sewers.

Runoff to sewer may create fire or explosion hazard.

***HEALTH HAZARDS**

May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

*** EMERGENCY ACTION ***

Keep unnecessary people away; isolate hazard area and deny entry.
Stay upwind; keep out of low areas.
Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection.
Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire.
CALL CHEMTREC AT 1-800-424-9300 FOR EMERGENCY ASSISTANCE. If water pollution occurs, notify the appropriate authorities.

***FIRE**

Small Fires: Dry chemical, CO2 or Halon, water spray or alcohol-resistant foam.
Large Fires: Water spray, fog or alcohol-resistant foam.
Move container from fire area if you can do it without risk.
Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks.
For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn.
Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.

***SPILL OR LEAK**

Shut off ignition sources; no flares, smoking or flames in hazard area.
Stop leak if you can do it without risk.
Water spray may reduce vapors; but it may not prevent ignition in closed spaces.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Large Spills: Dike far ahead of liquid spill for later disposal.

***FIRST AID**

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen.
In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water.
Remove and isolate contaminated clothing and shoes at the site.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.
The COMPILERS of the CHEMTOX database shall not be held liable for inaccuracies

HYDROGEN CYANIDE

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----- IDENTIFIERS -----

See other identifiers listed below under Regulations.

----- PROPERTIES -----

REACTIVITY WITH WATER:	No data on water reactivity
REACTIVITY WITH COMMON MATERIALS:	No data
STABILITY DURING TRANSPORT:	No Data
NEUTRALIZING AGENTS:	No data
POLYMERIZATION POSSIBILITIES:	No data
TOXIC FIRE GASES:	None reported other than possible unburned vapors
ODOR DETECTED AT (ppm):	Unknown
ODOR DESCRIPTION:	No data
100 % ODOR DETECTION:	No data

----- REGULATIONS -----

Page 1

Special provisions: 1,B9,B12,B14,B30,B64,T38,T43,T44
Packaging exceptions: 173.None
Non bulk packaging: 173.195
Bulk packaging: 173.244
Quantity limitations-
Passenger air/rail: Forbidden
Cargo aircraft only: Forbidden
Vessel stowage: D
Other stowage provisions:25,40,M2

STCC NUMBER: Not listed

CLEAN WATER ACT Sect.307:No
CLEAN WATER ACT Sect.311:Yes
CLEAN AIR ACT: Not listed
EPA WASTE NUMBER: P063
CERCLA REF: Not listed
RQ DESIGNATION: A 10 pounds (4.54 kg) CERCLA
SARA TPQ VALUE: 100 pounds
SARA Sect. 312
categories:

Acute toxicity: Toxic. LD50 > 50 and <= 500
mg/kg (oral rat).

LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 1.0 percent

UNITED STATES POSTAL SERVICE MAILABILITY:
Not given

----- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON -----

California Assembly Bill 2588 Air Toxics "Hot Spots" Chemicals.
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 111 List.
Clean Water Act Section 311 Hazardous Chemicals List.
DOT Inhalation Hazard Chemicals List
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
HYDROGEN CYANIDE, ABSORBED [74-90-8]
Massachusetts Substance List.
OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992
Pennsylvania Hazardous Substance List
RCRA Hazardous Waste
SARA Section 313 Toxic Chemicals List
SARA Title III Extremely Hazardous Substance. Sections 302 and 304.
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

----- TOXICITY DATA -----

SHORT TERM TOXICITY: Unknown

LONG TERM TOXICITY: unknown

TARGET ORGANS:

SYMPTOMS: Source:

CONC IDLH: Unknown

NIOSH REL: 4.7 ppm Ceiling exposures which shall at no time be exceeded(10-MIN) 5 mg/M3 Ceiling exposures which shall at no time be exceeded(10-MIN)

ACGIH TLV: Not listed

ACGIH STEL: Not listed

OSHA PEL: Not in Table Z-1-A

MAK INFORMATION: 10 ppm
11 mg/M3
Substance with systemic effects, onset of effect less than or equal to 2 hrs: Peak = 2xMAK for 30 minutes, 4 times per shift of 8 hours.
Danger of cutaneous absorption

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:

IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)

* orl-hmn LDLo:570 ug/kg PCOC** -,596,66

ihl-man TCLo:500 mg/m3/3M-C HUTODJ 3,57,84

SENSE ORGANS

Eye

Mydriasis(pupillary dilation)

BEHAVIORAL

Coma

LUNGS, THORAX, OR RESPIRATION

Respiratory depression

* ihl-hmn LCLo:120 mg/m3/1H JIHTAB 24,255,42

ihl-hmn LCLo:200 mg/m3/10M WHOTAC -,30,70

BEHAVIORAL

General anesthetic

LUNGS, THORAX, OR RESPIRATION

Dyspnea

GASTROINTESTINAL

Nausea or vomiting

* ihl-man LCLo:400 mg/m3/2M 85GMAT -,75,82

* scu-hmn LDLo:1 mg/kg SCJUAD 3(4),33,67

ivn-man TDLo:55 ug/kg NTIS** PB158-508

LUNGS, THORAX, OR RESPIRATION

Respiratory stimulation

LD50 value: No LD50 in RTECS 1992

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

ihl-rat LC50:160 ppm/30M

ivn-rat LD50:810 ug/kg

orl-mus LD50:3700 ug/kg

ihl-mus LC50:323 ppm/5M

ipr-mus LD50:2990 ug/kg

scu-mus LDLo:3 mg/kg

ivn-mus LD50:990 ug/kg

ims-mus LD50:2700 ug/kg

orl-dog LDLo:4 mg/kg

scu-dog LDLo:1700 ug/kg

ivn-dog LD50:1340 ug/kg

ivn-mky LD50:1300 ug/kg

ihl-cat LC50:850 mg/m3/1M

scu-cat LDLo:1100 ug/kg

ivn-cat LD50:810 ug/kg

orl-rbt LDLo:4 mg/kg

ihl-rbt LC50:850 mg/m3/1M

ipr-rbt LD50:1570 ug/kg

scu-rbt LD50:2500 ug/kg

ivn-rbt LD50:660 ug/kg

ims-rbt LD50:486 ug/kg

ocu-rbt LD50:1040 ug/kg

orl-pig LDLo:2 mg/kg

scu-gpg LDLo:100 ug/kg

ivn-gpg LD50:1430 ug/kg

orl-pgn LDLo:14 mg/kg

scu-pgn LDLo:2150 ug/kg

ims-pgn LDLo:1500 ug/kg

orl-dck LDLo:3280 ug/kg

scu-frg LDLo:60 mg/kg

ihl-dom LC50:1300 mg/m3/30S

ivn-dom LD50:660 ug/kg
ihl-mam LCLo:200 ppm/5M
ihl-mam LCLo:36 ppm/2H
orl-brd LDLo:600 ug/kg
orl-bwd LDLo:7500 ug/kg
scu-bwd LDLo:100 ug/kg
scu-brd LDLo:100 ug/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):

This chemical has no known mammalian reproductive toxicity.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

----- EPA's IRIS DATA SUMMARY -----
Hydrogen cyanide; CASRN 74-90-8 (04/01/92).

II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Hydrogen cyanide
CASRN -- 74-90-8

This substance/agent has not been evaluated by the U.S. EPA for evidence of human carcinogenic potential.

----- PROTECTION AND FIRST AID -----

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation.

----- INITIAL INCIDENT RESPONSE -----

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).

DOT SHIPPING NAME: Hydrogen cyanide, anhydrous, stabilized, [absorbed in a poro
DOT ID NUMBER: UN1614

ERG90

GUIDE 57

* POTENTIAL HAZARDS *

*HEALTH HAZARDS

Poisonous; may be fatal if inhaled, swallowed or absorbed through skin.
Contact may cause burns to skin and eyes.
Runoff from fire control or dilution water may cause pollution.

*FIRE OR EXPLOSION

May be ignited by heat, sparks or flames.
Container may explode in heat of fire.
Vapor explosion and poison hazard indoors, outdoors or in sewers.

* EMERGENCY ACTION *

Keep unnecessary people away; isolate hazard area and deny entry.
Stay upwind, out of low areas, and ventilate closed spaces before entering.

Positive pressure self-contained breathing apparatus (SCBA) and chemical protective clothing which is specifically recommended by the shipper or manufacturer may be worn. It may provide little or no thermal protection.

Structural firefighter's protective clothing is not effective with these materials.

CALL CHEMTREC AT 1-800-424-9300 AS SOON AS POSSIBLE, especially if there is no local hazardous materials team available.

*FIRE

Small Fires: Dry chemical, CO2, Halon, water spray or standard foam.

Large Fires: Water spray, fog or standard foam is recommended.

Move container from fire area if you can do it without risk.

Cool container with water using unmanned device until well after fire is out.

Fight fire from maximum distance. Stay away from ends of tanks.

Dike fire control water for later disposal; do not scatter the material.

*SPILL OR LEAK

Shut off ignition sources; no flares, smoking or flames in hazard area.
Fully-encapsulating, vapor-protective clothing should be worn for spills and leaks with no fire.

Do not touch spilled material; stop leak if you can do it without risk.
Water spray may reduce vapor; but it may not prevent ignition in closed spaces.

Small Spills: Take up with sand or other noncombustible absorbent material and place into containers from spill area.

Small Dry Spills: With clean shovel place material into clean, dry container and cover; move containers for later disposal.

Large Spills: Dike far ahead of liquid spill for later disposal.

*FIRST AID

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen.

In case of contact with material, immediately flush skin or eyes with

running water for at least 15 minutes.
Speed in removing material from skin is of extreme importance.
Remove and isolate contaminated clothing and shoes at the site.
Keep victim quiet and maintain normal body temperature.
Effects may be delayed; keep victim under observation.

ISOLATION DISTANCES FROM ERG90

Small spills:

First isolate in all directions - 600 ft
Then protect persons downwind - 2 miles

Large spills:

First isolate in all directions - 600 ft
Then protect persons downwind - 2 miles

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement. The COMPILERS of the CHEMTOX database shall not be held liable for inaccuracies or omissions within this database, or in any of its printed or displayed output forms.

LEAD

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----- IDENTIFIERS -----

See other identifiers listed below under Regulations.

-----, PROPERTIES -----

100 % ODOR DETECTION: No data

----- REGULATIONS -----

National Primary Ambient Air Quality Standards
1.5 ug/M3 maximum arithmetic mean averaged over a calendar year
National Secondary Ambient Air Quality Standards
same as primary standard

DOT hazard class: 6.1 POISON
DOT guide: 53
Identification number: UN2291
DOT shipping name: LEAD COMPOUNDS, SOLUBLE, N.O.S.
Packing group: II
Label(s) required: POISON
Special provisions:
Packaging exceptions: 173.153
Non bulk packaging: 173.213
Bulk packaging: 173.240
Quantity limitations-
Passenger air/rail: 100 KG
Cargo aircraft only: 200 KG
Vessel stowage: A
Other stowage provisions:

STCC NUMBER: Not listed

CLEAN WATER ACT Sect.307:Yes

CLEAN WATER ACT Sect.311:No

National Primary Drinking Water Regulations

Maximum Contaminant Levels (MCL): 0.05 mg/L (12/07/92)

Maximum Contaminant Level Goals (MCLG): 0 mg/L (12/07/92)

CLEAN AIR ACT: CAA '90 By category and CAA '77 Sect 109

EPA WASTE NUMBER: D008

CERCLA REF: Y

RQ DESIGNATION: X 1 pound (0.454 kg) CERCLA for pieces of solid meta
with diameter less than 100 micrometers (0.004
inches).

SARA TPQ VALUE: Not listed

SARA Sect. 312
categories:

Chronic toxicity: carcinogen

Chronic toxicity: adverse effect to target organ
after long period of exposure.

Chronic toxicity: mutagen.

Chronic toxicity: reproductive toxin.

LISTED IN SARA Sect 313: Yes

de minimus CONCENTRATION: 0.1 percent

UNITED STATES POSTAL SERVICE MAILABILITY:

Hazard class: ORM-B

Mailability: Domestic service and air transportation; shipper's declaration

Max per parcel: 25 LBS; 5 LBS

NFPA CODES:

HEALTH HAZARD (BLUE): Unspecified
FLAMMABILITY (RED) : Unspecified
REACTIVITY (YELLOW): Unspecified
SPECIAL : Unspecified

----- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON -----

ACGIH TLV list "Threshold Limit Values for 1989-1990"
California Assembly Bill 2588 Air Toxics "Hot Spots" Chemicals.
California Assembly Bill 1807 Toxic Air Contaminants.
California Proposition 65 Developmental Toxin List
California Proposition 65 Female Reproductive Toxin List
California Proposition 65 Male Reproductive Toxin List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 109 National Ambient Air Quality Standards List
Clean Air Act of November 15, 1990. List of pollutants.
Clean Water Act Section 307 Priority Pollutants
DOT Marine Pollutant. Proposed list. 57 FR 3854, Jan 31, 1992
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
LEAD [7439-92-1]
Massachusetts Substance List.
New Jersey DEQ100 list for release reporting.
New Jersey Right To Know Substance List. (December 1987)
New Jersey Right to Know Substance List. Listed as a teratogen.
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
OSHA Specifically regulated substance. See 29 CFR 1910.1025
Pennsylvania Hazardous Substance List
RCRA Hazardous Waste
RCRA Toxicity Characteristics (TC) list dated March 29, 1990
SARA Section 313 Toxic Chemicals List

----- TOXICITY DATA -----

SHORT TERM TOXICITY: LASSITUDE, INSOMNIA, PALLOR, EYE GROUND, ANOREXIA,
LOW-WEIGHT, MALNUTRITION, CONSTIPATION, ABDOMINAL
PAIN, COLIC; HYPOTENSE, ANEMIA; GINGIVAL LEAD LINE;
TREMBLING PARALYSIS WRIST. ** Source: 2

LONG TERM TOXICITY: unknown

TARGET ORGANS: gi, CNS, kidneys, blood, gingival tissue

SYMPTOMS: LASS, INSOM, PAL, EYE GROUND, ANOR, LOW-WT, MALNUT,
CONSTI, ABDOM PAIN, COLIC; HYPOTENSE, ANEMIA, GINGIVAL
LEAD LINE; TREM, PARA WRIST. METALLIC TASTE, INCREASED
SALIVATION, PYORRHEA (FLOW OF MUCOUS). NEUROMUSCULAR:
NUMBNESS AND TINGLING OF EXTREMITIES WITH SENSORY

DISTRUBANCE, EXTENSOR WEAKNESS OF WRISTS AND ANKLES, LOSS OF MUSCLE TONE, TREMOR INCREASED DEEP-TENDON REFLEXES, MUSCULAR CRAMPS AND ACHING, MUSCULAR ATROPHY. CNS: VISUAL DISTURBANCES, HEADACHE, NERVOUSNESS OF DEPRESSION, INSOMNIA, MENTAL CONFUSION, DELIRIUM. Source: NIOSHP, THIC

CONC IDLH: 700mg/M3

NIOSH REL: <0.1 mg/M3 Air level to be maintained so that worker blood level remains <0.06 mg/100 g of whole blood

ACGIH TLV: TLV = 0.15mg/M3

ACGIH STEL: Not listed

OSHA PEL: Final Rule Limits:
TWA = See 29 CFR 1910.1025
50 ug/M3

MAK INFORMATION: 0.1 mg/M3
Substance with systemic effects, onset of effect over 2 hours: Peak = 10xMAK for 30 minutes, once per shift of 8 hours.

CARCINOGEN?: Y STATUS: See below

CARCINOGEN LISTS:

IARC: Carcinogen defined by IARC to be possibly carcinogenic to humans, but having (usually) no human evidence.

MAK: Not listed

NIOSH: Not listed

NTP: Not listed

ACGIH: Not listed

OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)
orl-wmn TDLo:450 mg/kg/6Y JAMAAP 237,2627,77
PERIPHERAL NERVE AND SENSATION
Flaccid paralysis without anesthesia
BEHAVIORAL
Hallucinations, distorted perceptions
BEHAVIORAL
Muscle weakness

LD50 value: No LD50 in RTECS 1992

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

ipr-rat LDLo:1 gm/kg

orl-pgn LDLo:160 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):

This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

orl-rat TDLo:790 mg/kg (multigenerations) AEHLAU
23,102,71

EFFECTS ON EMBRYO OR FETUS

Fetotoxicity(except death,e.g.,stunted fetus)

EFFECTS ON EMBRYO OR FETUS

Fetal death

orl-rat TDLo:1140 mg/kg (14D pre-21D post) PHMCAA
20,201,78

EFFECTS ON NEWBORN

Behavioral

orl-rat TDLo:520 mg/kg (7-22D preg/10D post) FEPRA7
37,394,78

EFFECTS ON NEWBORN

orl-rat TDLo:1100 mg/kg (1-22D preg) FEPRA7 37,895,78

SPECIFIC DEVELOPMENTAL ABNORMALITIES

Blood and lymphatic systems(including spleen and
marrow)

EFFECTS ON NEWBORN

Growth statistics(e.g.,reduced weight gain)

ihl-rat TCLo:10 mg/m3/24H (1-21D preg) ZHPMAT
165,294,77

EFFECTS ON EMBRYO OR FETUS

Fetotoxicity(except death,e.g.,stunted fetus)

SPECIFIC DEVELOPMENTAL ABNORMALITIES

Blood and lymphatic systems(including spleen and
marrow)

ihl-rat TCLo:3 mg/m3/24H (1-21D preg) ZHPMAT 165,294,77

EFFECTS ON NEWBORN

orl-mus TDLo:1120 mg/kg (multigenerations) AEHLAU
23,102,71

EFFECTS ON EMBRYO OR FETUS

Fetotoxicity(except death,e.g.,stunted fetus)

EFFECTS ON EMBRYO OR FETUS

Fetal death

orl-mus TDLo:6300 mg/kg (1-21D preg) EXPEAM 31,1312,75

EFFECTS ON FERTILITY

Female fertility index
EFFECTS ON FERTILITY
Pre-implantation mortality

orl-mus TDLo:300 mg/kg (1-2D preg) TXCYAC 6,129,76
EFFECTS ON FERTILITY
Other measures of fertility

orl-mus TDLo:4800 mg/kg (1-16D preg) BECTA6 18,271,77
EFFECTS ON EMBRYO OR FETUS
Cytological changes(including somatic cell genetic material)

orl-dom TDLo:662 mg/kg (1-21W preg) TXAPA9 25,466,73
EFFECTS ON NEWBORN
Behavioral

NO SIGNIFICANT
RISK LEVEL(Ca P65): E0.5 micrograms/day

----- EPA's IRIS DATA SUMMARY -----
Lead and compounds (inorganic); CASRN 7439-92-1 (04/01/92)

II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Lead and compounds (inorganic)
CASRN -- 7439-92-1
Last Revised -- 05/01/91

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- B2; probable human carcinogen

Basis -- Sufficient animal evidence. Ten rat bioassays and one mouse assay have shown statistically significant increases in renal tumors with dietary and subcutaneous exposure to several soluble lead salts. Animal assays provide reproducible results in several laboratories, in multiple rat strains with some evidence of multiple tumor sites. Short term studies show that lead affects gene expression. Human evidence is inadequate.

II.A.2. HUMAN CARCINOGENICITY DATA

Inadequate. There are four epidemiologic studies of occupational cohorts exposed to lead and lead compounds. Two studies (Dingwall-Fordyce and Lane, 1963; Nelson et al., 1982) did not find any association between exposure and cancer mortality. Selevan et al. (1985), in their retrospective cohort mortality study of primary lead smelter workers, found a slight decrease in the total cancer mortality (SMR=95). Apparent excesses were observed for respiratory cancer (SMR=111, obs=41, $p>0.05$) and kidney cancer (SMR=204, obs=6, $p>0.05$). Cooper and Gaffey (1975) and Cooper (1985 update) performed a cohort mortality study of battery plant workers and lead smelter workers. They found statistically significant excesses for total cancer mortality (SMR=113, obs=344), stomach cancer (SMR=168, obs=34), and lung cancer (SMR=124, obs=109) in the battery plant workers. Although similar excesses were observed in the smelter workers, they were not statistically significant. Cooper and Gaffey (1975) felt it was possible that individual subjects were monitored primarily on the basis of obvious signs of lead exposure, while others who showed no symptoms of lead poisoning were not monitored.

All of the available studies lacked quantitative exposure information, as well as information on the possible contribution from smoking. All studies also included exposures to other metals such as arsenic, cadmium, and zinc for which no adjustment was done. The cancer excesses observed in the lung and stomach were relatively small (<200). There was no consistency of site among the various studies, and no study showed any dose-response relationship. Thus, the available human evidence is considered to be inadequate to refute or demonstrate any potential carcinogenicity for humans from lead exposure.

II.A.3. ANIMAL CARCINOGENICITY DATA

Sufficient. The carcinogenic potential of lead salts (primarily phosphates and acetates) administered via the oral route or by injection has been demonstrated in rats and mice by more than 10 investigators. The most characteristic cancer response is bilateral renal carcinoma. Rats given lead acetate or subacetate orally have developed gliomas, and lead subacetate also produced lung adenomas in mice after i.p. administration. Most of these investigations found a carcinogenic response only at the highest dose. The lead compounds tested in animals are almost all soluble salts. Metallic lead, lead oxide and lead tetraalkyls have not been tested adequately. Studies of inhalation exposure have not been located in the literature.

Azar et al. (1973) administered 10, 50, 100, and 500 ppm lead as lead

acetate in dietary concentrations to 50 rats/sex/group for 2 years. Control rats (100/sex) received the basal laboratory diet. In a second 2-year feeding study, 20 rats/group were given diets containing 0, 1000, and 2000 ppm lead as lead acetate. No renal tumors were reported in the control groups or in treated animals of either sex receiving 10 to 100 ppm. Male rats fed 500, 1000, and 2000 ppm lead acetate had an increased renal tumor incidence of 5/50, 10/20, and 16/20, while 7/20 females in the 2000-ppm group developed renal tumors.

The Azar et al. (1973) study is limited by the lack of experimental detail. The possibility of environmental contamination from lead in the air or drinking water was not mentioned. The strains of rats used were not specified in the study, but the Health Effects Assessment for Lead (U.S. EPA, 1984) indicates the rats were Wistar strain. The weight gain at 1000 and 2000 ppm was reported to be depressed, but details were not given.

Kasprzak et al. (1985), in investigating the interaction of dietary calcium on lead carcinogenicity, fed 1% lead subacetate (8500 ppm Pb) to male Sprague-Dawley rats in the diet for 79 weeks. Of the rats surviving (29/30) in this treatment group beyond 58 weeks, 44.8% had renal tumors. Four rats had adenocarcinomas; the remaining nine had adenomas. Bilateral tumors were noted. No renal tumors were noted among the controls.

As part of a study to determine interactions between sodium nitrite, ethyl urea and lead, male Sprague-Dawley rats were given lead acetate in their drinking water for 76 weeks (Koller et al., 1986). The concentration of lead was 2600 ppm. No kidney tumors were detected among the 10 control rats. Thirteen of 16 (81%) lead-treated rats had renal tubular carcinoma; three tumors were detected at 72 weeks and the remainder detected at the termination of the study.

Van Esch and Kroes (1969) fed basic lead acetate at 0; 0.1%, and 1.0% in the diet to 25 Swiss mice/sex/group for 2 years. No renal tumors developed in the control group, but 6/25 male mice of 0.1% basic lead acetate group had renal tumors (adenomas and carcinomas combined). In the 1.0% group, one female had a renal tumor. The authors thought that the low incidence in the 1.0% group was due to early mortality.

Hamsters given lead subacetate at 0.5% and 1% in the diet had no significant renal tumor response (Van Esch and Kroes, 1969).

II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

Lead acetate induces cell transformation in Syrian hamster embryo cells (DiPaolo et al., 1978) and also enhances the incidence of simian adenovirus induction. Lead oxide showed similar enhanced adenovirus induction (Casto et al., 1979).

Under certain conditions lead compounds are capable of inducing chromosomal aberrations in vivo and in tissue cultures. Grandjean et al. (1983) showed a relationship between SCE and lead exposure in exposed workers.

Lead has been shown, in a number of DNA structure and function assays, to affect the molecular processes associated with the regulation of gene expression (U.S. EPA, 1986).

II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

Not available.

Quantifying lead's cancer risk involves many uncertainties, some of which may be unique to lead. Age, health, nutritional state, body burden, and exposure duration influence the absorption, release, and excretion of lead. In addition, current knowledge of lead pharmacokinetics indicates that an estimate derived by standard procedures would not truly describe the potential risk. Thus, the Carcinogen Assessment Group recommends that a numerical estimate not be used.

II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

Not available.

II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

II.D.1. EPA DOCUMENTATION

U.S. EPA. 1984. Health Effects Assessment for Lead. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH, for the Office of Emergency and Remedial Response, Washington, DC. EPA/540/1-86/055. NTIS PB85-163996/AS.

U.S. EPA. 1986. Air Quality Criteria Document for Lead. Volumes III, IV. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Research Triangle Park, NC, for the Office of Air Quality Planning and Standards. EPA-600/8-83/028dF.

U.S. EPA. 1987. Preliminary review of the carcinogenic potential of lead associated with oral exposure. Prepared by the Office of Health and Environmental Assessment, Carcinogenic Assessment Group, Washington DC, for the Office of Drinking Water, Office of Solid Waste and the Office of Emergency and Remedial Response (Superfund). OHEA-C-267. Internal Review Draft.

___II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The review of the carcinogenic potential of lead associated with oral exposure has received Agency review.

The 1986 Air Quality Criteria Document for Lead has received Agency and External Review.

Agency Work Group Review: 05/04/88

Verification Date: 05/04/88

___II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

William Pepelko / ORD -- (202)260-5898 / FTS 260-5898

James Cogliano / ORD -- (202)260-9243 / FTS 260-9243

----- PROTECTION AND FIRST AID -----

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
At the end of each work shift.

** REMOVE CLOTHING:
Promptly remove non-impervious clothing that becomes contaminated.

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (LEAD)

Not in excess of 0.5 mg/M3: Half-mask, air-purifying respirator
equipped with high efficiency filters.

Not in excess of 2.5 mg/M3: Full facepiece air-purifying respirator
equipped with high-efficiency filters.

Not in excess of 50 mg/M3: (1) Any powered, air-purifying respirator with high efficiency filters; or (2) Half-mask supplied-air respirator operated in positive-pressure mode.

Not in excess of 100 mg/M3: Supplied air respirator with full facepiece hood, or helmet or suit and operated in positive pressure mode.

Unknown concentration or Firefighting: Full facepiece, self-contained breathing apparatus operated in postive-pressure mode.

FIRST AID SOURCE: NIOSH

EYE: irr immed

SKIN: soap flush promptly

INHALATION: art resp

INGESTION: water, vomit

FIRST AID SOURCE: DOT Emergency Response Guide 1990.

Move victim to fresh air; call emergency medical care. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site.

----- INITIAL INCIDENT RESPONSE -----

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).

DOT SHIPPING NAME: LEAD COMPOUNDS, SOLUBLE, N.O.S.

DOT ID NUMBER: UN2291

ERG90

GUIDE 53

* POTENTIAL HAZARDS *

*HEALTH HAZARDS

Poisonous if swallowed.

Inhalation of dust poisonous.

Fire may produce irritating or poisonous gases.

Runoff from fire control or dilution water may cause pollution.

*FIRE OR EXPLOSION

Some of these materials may burn, but none of them ignites readily.

* EMERGENCY ACTION *

Keep unnecessary people away; isolate hazard area and deny entry.

Stay upwind; keep out of low areas.

Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection.

CALL CHEMTREC AT 1-800-424-9300 FOR EMERGENCY ASSISTANCE. If water pollution occurs, notify the appropriate authorities.

*FIRE

Small Fires: Dry chemical, CO2, water spray or regular foam.

Large Fires: Water spray, fog or regular foam.

Move container from fire area if you can do it without risk.

*SPILL OR LEAK

Do not touch or walk through spilled material; stop leak if you can do it without risk.

Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.

Small Dry Spills: With clean shovel place material into clean, dry container and cover; move containers from spill area.

Large Spills: Dike far ahead of liquid spill for later disposal.

***FIRST AID**

Move victim to fresh air; call emergency medical care.

In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes.

Remove and isolate contaminated clothing and shoes at the site.

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METHYL CHLORIDE
AND
METHYLENE CHLORIDE MIXTURE

CHEMTOX DATA

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----- IDENTIFIERS -----

CHEMTOX RECORD 572

LAST UPDATE OF THIS RECORD: 06/03/93

NAME: METHYL CHLORIDE
SYNONYMS: ARTIC; CHLOOR-METHAAN (Dutch); CHLOR-METHAN (German);
CHLOROMETHANE; CHLORURE DE METHYLE (French); CLOROMETANO
(Italian); CLORURO DI METILE (Italian); METHYLCHLORID
(German); METHYL CHLORIDE; METHYL CHLORIDE (DOT); METYLU
CHLOREK (Polish); MONOCHLOROMETHANE; METHANE, CHLORO-;
MONCHLOROMETHANE
CAS: 74-87-3 RTECS: PA6300000
FORMULA: CH3Cl MOL WT: 50.49
WLN: G1
CHEMICAL CLASS: TT

See other identifiers listed below under Regulations.

----- PROPERTIES -----

PHYSICAL DESCRIPTION: colorless gas with a faint, sweet odor which is not
noticed at dangerous concentrations

BOILING POINT:	248.718 K	-24.5 C	-12 F
MELTING POINT:	175.392 K	-97.8 C	-144 F
FLASH POINT:	NA		
AUTO IGNITION:	905.3722 K	632.2 C	1661.6 F
CRITICAL TEMP:	416.8 K	143.65 C	290.57 F
CRITICAL PRESS:	6.68 kN/M2	65.8 atm	967 psia
HEAT OF VAP:	182.3 Btu/lb	101.24 cal/g	4.236x E5 J/kg
HEAT OF COMB:	-5290 Btu/lb	-2941 cal/g	-123x E5 J/kg
VAPOR PRESSURE:	4.8 ATM		
UEL:	19 %		
LEL:	7.6 %		
IONIZATION POTENTIAL (eV):	11.26		
VAPOR DENSITY:	1.7 (air=1)		
SPECIFIC GRAVITY:	0.997 -24C		
DENSITY:	0.997 g/cc	or	9.2721 lb/gal
WATER SOLUBILITY:	INSOL		
INCOMPATIBILITIES:	chemically active metals; potassium, powdered aluminum, zinc, magnesium		

REACTIVITY WITH WATER: No data on water reactivity
REACTIVITY WITH COMMON MATERIALS: REACTS WITH ZINC, ALUMINUM, MAGNESIUM,
AND THEIR ALLOYS; REACTION IS NOT
VIOLENT

STABILITY DURING TRANSPORT: No Data
NEUTRALIZING AGENTS: No data
POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible
unburned vapors

ODOR DETECTED AT (ppm): 100 PPM
ODOR DESCRIPTION: ETHER-LIKE Source: NYDH
100 % ODOR DETECTION: No data

----- REGULATIONS -----

DOT hazard class: 2.1 FLAMMABLE GAS
DOT guide: 18
Identification number: UN1063
DOT shipping name: Methyl chloride
Packing group:
Label(s) required: FLAMMABLE GAS
Special provisions: B13, B14
Packaging exceptions: 173. None
Non bulk packaging: 173.304
Bulk packaging: 173.314, 315
Quantity limitations-
Passenger air/rail: Forbidden
Cargo aircraft only: 25 kg
Vessel stowage: D
Other stowage provisions: 40

STCC NUMBER: 4905761

CLEAN WATER ACT Sect. 307: Yes
CLEAN WATER ACT Sect. 311: No
CLEAN AIR ACT: CAA '90 Listed
EPA WASTE NUMBER: U045, D001
CERCLA REF: Y
RQ DESIGNATION: B 100 pounds (45.4 kg) CERCLA
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:

Acute toxicity: Highly toxic. LD50 is 50 mg/kg
or less (oral rat).
Chronic toxicity: carcinogen
Chronic toxicity: adverse effect to target organ
after long period of exposure.
Chronic toxicity: mutagen.
Chronic toxicity: reproductive toxin.
Sudden pressure: compressed gases.
Fire hazard: flammable.

LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 1.0 percent

UNITED STATES POSTAL SERVICE MAILABILITY:

Hazard class: Compressed gas, flammable - Mailable as ORM-D
Mailability: Domestic surface mail only
Max per parcel: 27.7 FLUID OZ PER PARCEL

NFPA CODES:

HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with self-contained breathing apparatus.
FLAMMABILITY (RED) : (4) This material forms readily ignitable mixtures in air.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

----- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON -----

ACGIH TLV list "Threshold Limit Values for 1989-1990"
California Assembly Bill 1803 Well Monitoring Chemicals.
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 111 List.
Clean Air Act of November 15, 1990. List of pollutants.
Clean Water Act Section 307 Priority Pollutants
DOT Hazardous Materials Table. 49 CFR 172.101
EPA Carcinogen Assessment Group List
EPA TSCA 8(a) Preliminary Assessment Information Rule - effective 11/19/82
EPA TSCA 8(d) Health and Safety Data Rule - effective date 10/04/82
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Section 12(b) Export Rule Notification.
EPA TSCA Test Submission (TSCATS) Database - September 1989
METHYL CHLORIDE [74-87-3]
Massachusetts Substance List.
New Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992
Pennsylvania Hazardous Substance List
RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264
RCRA Hazardous Waste
SARA Section 313 Toxic Chemicals List
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
Washington State Discarded Chemical Products List, November 17, 1989
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

----- TOXICITY DATA -----

SHORT TERM TOXICITY: INHALATION: illness has been reported at concentrations of 500 ppm. 10,000 ppm for 30 minutes has caused death. can cause nausea, vomiting, painful neck, loss of appetite; more severe exposure may result in the above plus headache, diarrhea, dizziness, loss of coordination, tremors of hands and lips, drooping eyelids and eye twitch; very severe exposure may include the above plus burning sensation in mouth and throat, mustard-like taste, difficulty in swallowing, hallucinations, loss of memory, cold and clammy skin, rapid breathing, unconsciousness, coma and death. onset of symptoms may be delayed several hours after exposure. effects may last weeks or

months. SKIN: contact with liquified gas may cause freezing of skin; other symptoms are muscular pain, anemia, muscle weakness and fever. Eyes: may cause irritation, dimness of sight and abnormally dilated pupils. INGESTION: ingestion of liquified gas will cause freezing of mouth and throat.(NYDH)

LONG TERM TOXICITY: symptoms of long term exposure are derived primarily from industrial accidents and exposure levels are unknown. however, inhalation can cause fatigue, loss of appetite, pale skin, weakness, drowsiness, nausea, vomiting and damage to heart, nerves and liver. some effects may last months or longer. contact with the skin may cause reddening and blistering of surface, visual disturbances, weakness, fever, drowsiness, anemia and muscle pain.(NYDH)

TARGET ORGANS: CNS, liver, kidneys, skin

SYMPTOMS: Inhalation causes nausea, vomiting, weakness, headache, emotional disturbances; high concentrations cause mental confusion, eye disturbances, muscular tremors, cyanosis, convulsions. Contact of liquid with skin may cause frostbite. Source: CHRIS

CONC IDLH: 10000PPM

NIOSH REL: Potential occupational carcinogen --LOWEST FEASIBLE (Limit of quantitation 1.6)

ACGIH TLV: TLV = 50ppm SKIN

ACGIH STEL: STEL = 100 mg/M3»SKIN

OSHA PEL: Transitional Limits:
PEL = 100 PPM; CEILING = 200; MAXIMUM PEAK ABOVE CEILING FOR
Final Rule Limits:
TWA = 50 ppm (105 mg/M3)
STEL = 100 ppm(210 mg/M3)

MAK INFORMATION: 50 ppm
105 mg/M3
Substance with systemic effects, onset of effect less than or equal to 2 hrs: Peak = 2xMAK for 30 minutes, 4 times per shift of 8 hours.
Risk of damage to the developing embryo or fetus must be considered probable. Damage cannot be excluded even when the MAK values are adhered to.
A compound which is justifiably suspected of having carcinogenic potential.

CARCINOGEN?: Y STATUS: See below

CARCINOGEN LISTS:

IARC: Not classified as to human
carcinogenicity or probably not
carcinogenic to humans.
MAK: A compound which is
justifiably suspected of having
carcinogenic potential.
NIOSH: Carcinogen defined by NIOSH
with no further categorization.
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)

ihl-hmn LCLo:20000 ppm/2H 34ZIAG -,386,69

SENSE ORGANS

Eye

Other

BEHAVIORAL

Convulsions or effect on seizure threshold

GASTROINTESTINAL

Nausea or vomiting

LD50 value: orl-rat LD50:1800 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:1800 mg/kg

ihl-rat LC50:5300 mg/m3/4H

ihl-mus LC50:2200 ppm/6H

ihl-dog LCLo:14661 ppm/6H

ihl-cat LCLo:129 mg/m3/4H

ihl-gpg LCLo:20000 ppm/2H

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):

This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

ihl-rat TCLo:2000 ppm/6H (5D male) JACTDZ 4(1),224,85

PATERNAL EFFECTS

Spermatogenesis

ihl-rat TCLo:1500 ppm/6H (50D male) EPASR*
8EHQ-1182-0464

PATERNAL EFFECTS

Testes,epididymis,sperm duct

ihl-rat TCLo:1500 ppm/6H (7-19D preg) TJADAB 27,181,83

EFFECTS ON EMBRYO OR FETUS

Fetotoxicity(except death,e.g.,stunted fetus)

SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rat TCLo:3000 ppm/6H (5D male) TOXID9 4,82,84
PATERNAL EFFECTS
Spermatogenesis
PATERNAL EFFECTS
Testes,epididymis,sperm duct
EFFECTS ON FERTILITY
Post-implantation mortality

ihl-rat TCLo:3000 ppm/6H (5D male) TXAPA9 86,124,86
EFFECTS ON FERTILITY
Male fertility index

ihl-mus TCLo:500 ppm/6H (6-17D preg) TJADAB 27,197,83
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Cardiovascular(circulatory)system

----- PROTECTION AND FIRST AID -----

PROTECTION SUGGESTED

FROM THE CHRIS MANUAL:

approved canister mask; leather or vinyl gloves; goggles or face shield.

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:

Skin becoming wet or frozen.

** WEAR EYE PROTECTION TO PREVENT:

Reasonable probability of eye contact.

** REMOVE CLOTHING:

Immediately remove any clothing that becomes wet to avoid any flammability

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (METHYL CHLORIDE)

Greater at any detectable concentration. : Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.

ESCAPE: Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: CHRIS Manual 1991

Remove to fresh air. Call a doctor and have patient hospitalized for observation of slowly developing symptoms.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed, keep victim under observation.

----- INITIAL INCIDENT RESPONSE -----

FIRE EXTINGUISHMENT: Dry chemical or carbon dioxide. Stop flow of gas.
CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).

DOT SHIPPING NAME: Methyl chloride

DOT ID NUMBER: UN1063

ERG90

GUIDE 18

* POTENTIAL HAZARDS *

*HEALTH HAZARDS

Poisonous; may be fatal if inhaled, swallowed or absorbed through skin.
Contact causes burns to skin and eyes.
Contact with liquid may cause frostbite.
Runoff from fire control or dilution water may cause pollution.

*FIRE OR EXPLOSION

Extremely flammable; may be ignited by heat, sparks, or flames.
Vapors may travel to a source of ignition and flash back.
Container may explode in heat of fire.
Vapor explosion and poison hazard indoors, outdoors or in sewers.

* EMERGENCY ACTION *

Keep unnecessary people away; isolate hazard area and deny entry.
Stay upwind, out of low areas, and ventilate closed spaces before entering.
Positive pressure self-contained breathing apparatus (SCBA) and chemical protective clothing which is specifically recommended by the shipper or manufacturer may be worn. It may provide little or no thermal protection.
Structural firefighters' protective clothing is not effective for these materials.
Isolate the leak or spill area immediately for at least 150 feet in all directions.
See the Table if Initial Isolation and Protective Action Distances.
If you find the ID Number and the name of the material there, begin protective action.
Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire.
CALL CHEMTREC AT 1-800-424-9300 FOR EMERGENCY ASSISTANCE. If water pollution occurs, notify the appropriate authorities.

*FIRE

Small Fires: Let burn unless leak can be stopped immediately.

Large Fires: Water spray, fog or regular foam.

Move container from fire area if you can do it without risk.

Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks.

For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.

***SPILL OR LEAK**

Shut off ignition sources; no flares, smoking or flames in hazard area.

Fully-encapsulating, vapor-protective clothing should be worn for spills and leaks with no fire.

Stop leak if you can do it without risk.

Use water spray to reduce vapors; isolate area until gas has dispersed.

***FIRST AID**

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen.

In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes.

Remove and isolate contaminated clothing and shoes at the site.

Keep victim quiet and maintain normal body temperature.

Effects may be delayed, keep victim under observation.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.

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METHYL ISOBUTYL KETONE

CHEMTOX DATA

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----- IDENTIFIERS -----

CHEMTOX RECORD 2227 LAST UPDATE OF THIS RECORD: 06/03/93
NAME: METHYL ISOBUTYL KETONE
SYNONYMS: HEXONE ; 4-METHYL-2-PENTANONE; METHYL ISOBUTYL KETONE;
ISOBUTYL METHYL KETONE; MIBK; 2-PENTANONE, 4-METHYL-;
ISOPROPYL ACETONE
CAS: 108-10-1 RTECS: SA9275000
FORMULA: C6H12O MOL WT: 100.18
WLN: 1Y1
CHEMICAL CLASS: Ketone

See other identifiers listed below under Regulations.

----- PROPERTIES -----

PHYSICAL DESCRIPTION: colorless liquid

BOILING POINT:	390.93 K	117.7 C	244 F
MELTING POINT:	189.27 K	-83.9 C	-119 F
FLASH POINT:	295 K	21.85 C	71.3 F
AUTO IGNITION:	733.15 K	460 C	1351.6 F
CRITICAL TEMP:	571.5 K	298.35 C	569.03 F
CRITICAL PRESS:	3.27 kN/M2	32.2 atm	473 psia
HEAT OF VAP:	149 Btu/lb	82.75 cal/g	3.462x E5 J/kg
HEAT OF COMB:	-10400 Btu/lb	-5782 cal/g	-242x E5 J/kg
VAPOR PRESSURE:	15 MM		
UEL:	7.5 %		
LEL:	1.4 %		
IONIZATION POTENTIAL (eV):	6.7		
VAPOR DENSITY:	3.45 (air=1)		
EVAPORATION RATE:	1.70(n-BUTYL ACETATE=1)		
SPECIFIC GRAVITY:	.802 @ 20 C		
DENSITY:	0.8 g/mL @ 20 C		
WATER SOLUBILITY:	1.9%		
INCOMPATIBILITIES:	strong oxidizers		

REACTIVITY WITH WATER: 0
REACTIVITY WITH COMMON MATERIALS: READILY MISCIBLE WITH ALMOST ALL
ORGANIC SOLVENTS Source: THIC
STABILITY DURING TRANSPORT: No Data
NEUTRALIZING AGENTS: NOT PERTINENT Source: HCDB
POLYMERIZATION POSSIBILITIES: NOT PERTINENT Source: HCDB

TOXIC FIRE GASES: IRRITATING VAPORS ARE GENERATED WHEN
HEATED

ODOR DETECTED AT (ppm): 0.47 ppm
ODOR DESCRIPTION: sharp; non-residual; ketonic Source: CHRIS
100 % ODOR DETECTION: 70,357 ■HED2,857 ppm

----- REGULATIONS -----

DOT hazard class: 3 FLAMMABLE LIQUID
DOT guide: 26
Identification number: UN1245
DOT shipping name: Methyl isobutyl ketone
Packing group: II
Label(s) required: FLAMMABLE LIQUID
Special provisions: T1
Packaging exceptions: 173.150
Non bulk packaging: 173.202
Bulk packaging: 173.242
Quantity limitations-
Passenger air/rail: 5 L
Cargo aircraft only: 60 L
Vessel stowage: B
Other stowage provisions:

STCC NUMBER: 4909245

CLEAN WATER ACT Sect.307:No
CLEAN WATER ACT Sect.311:No
CLEAN AIR ACT: CAA '90 Listed
EPA WASTE NUMBER: U161,D001
CERCLA REF: Y
RQ DESIGNATION: D 5000 pounds (2270 kg) CERCLA
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:

Acute toxicity: Irritant
Acute toxicity: adverse effect to target organs.
Chronic toxicity: reproductive toxin.
Fire hazard: flammable.

LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 1.0 percent

UNITED STATES POSTAL SERVICE MAILABILITY:
Not given

NFPA CODES:

HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with
self-contained breathing apparatus.
FLAMMABILITY (RED) : (3) This material can be ignited under almost all
temperature conditions.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

----- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON -----

ACGIH TLV list "Threshold Limit Values for 1989-1990"

California Assembly Bill 1803 Well Monitoring Chemicals.
 Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
 Clean Air Act of November 15, 1990. List of pollutants.
 DOT Hazardous Materials Table. 49 CFR 172.101
 EPA TSCA 8(a) Preliminary Assessment Information Rule - effective 11/19/82
 EPA TSCA 8(d) Health and Safety Data Rule - effective date 10/04/82
 EPA TSCA Chemical Inventory List 1989
 EPA TSCA Chemical Inventory List 1990
 EPA TSCA Chemical Inventory List 1992
 EPA TSCA Test Submission (TSCATS) Database - April 1990
 EPA TSCA Test Submission (TSCATS) Database - September 1989
 METHYL ISOBUTYL KETONE [108-10-1]
 Massachusetts Substance List.
 New Jersey Right To Know Substance List. (December 1987)
 OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
 OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992
 Pennsylvania Hazardous Substance List
 RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264
 RCRA Hazardous Waste
 SARA Section 313 Toxic Chemicals List
 Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
 Washington State Discarded Chemical Products List, November 17, 1989
 Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

----- TOXICITY DATA -----

SHORT TERM TOXICITY: Unknown

LONG TERM TOXICITY: unknown

TARGET ORGANS: resp sys, eyes, skin, CNS

SYMPTOMS: Vapor causes irritation of eyes and nose; high
 concentrations cause anesthesia and depression. Liquid
 dries out skin and may cause dermatitis; irritates
 eyes but does not injure them. Source: CHRIS

CONC IDLH: Unknown

NIOSH REL: 50 ppm Time weighted averages for 8-hour exposure 205
 mg/M3 Time weighted averages for 8-hour exposure

ACGIH TLV: TLV = 50ppm
 ACGIH STEL: STEL = 75 ppm

OSHA PEL: Transitional Limits:
 PEL = 100 ppm(410mg/M3)
 Final Rule Limits:
 TWA = 50 ppm (205 mg/M3)
 STEL = 75 ppm(300 mg/M3)

MAK INFORMATION: 100 ppm
400 mg/M3
Substance with systemic effects, onset of effect less than or equal to 2 hrs: Peak = 5xMAK for 30 minutes, 2 times per shift of 8 hours.
Danger of cutaneous absorption

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:

IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

LD50 value: orl-rat LD50:2080 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:2080 mg/kg
ipr-rat LD50:400 mg/kg
orl-mus LD50:2671 mg/kg
ihl-mus LC50:23300 mg/m3
ipr-mus LD50:268 mg/kg
skn-rbt LD50:>20 gm/kg
orl-gpg LD50:1600 mg/kg
ipr-gpg LD50:800 mg/kg
unr-mam LD50:1396 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):

This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

ihl-rat TCLo:300 ppm/6H (6-15D preg) FAATDF 8,310,87
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-mus TCLo:3000 ppm/6H (6-15D preg) FAATDF 8,310,87
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
EFFECTS ON EMBRYO OR FETUS
Fetal death

----- PROTECTION AND FIRST AID -----

PROTECTION SUGGESTED

FROM THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

**** WEAR APPROPRIATE EQUIPMENT TO PREVENT:**

Repeated or prolonged skin contact.

**** WEAR EYE PROTECTION TO PREVENT:**

Reasonable probability of eye contact.

**** EXPOSED PERSONNEL SHOULD WASH:**

Promptly when skin becomes wet.

**** REMOVE CLOTHING:**

Immediately remove any clothing that becomes wet to avoid any flammability

**** REFERENCE: NIOSH**

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (METHYL ISOBUTYL KETONE)

500 ppm: Any chemical cartridge respirator with organic vapor cartridge(s). * Substance reported to cause eye irritation or damage may require eye protection. / Any supplied-air respirator. * Substance reported to cause eye irritation or damage may require eye protection. / Any self-contained breathing apparatus. * Substance reported to cause eye irritation or damage may require eye protection.

1000 ppm: Any powered air-purifying respirator with organic vapor cartridge(s). * Substance reported to cause eye irritation or damage may require eye protection. / Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s).

1250 ppm: Any supplied-air respirator operated in a continuous flow mode. * Substance reported to cause eye irritation or damage may require eye protection.

2500 ppm: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any self-contained breathing apparatus with a full facepiece. / Any supplied-air respirator with a full facepiece. / Any supplied-air respirator with a tight-fitting facepiece operated in a continuous flow mode.

3000 ppm: Any supplied-air respirator with a full facepiece and operated in a pressure-demand or other positive pressure mode.

EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.: Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.

ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: NIOSH
EYE: irr immed
SKIN: water flush promptly
INHALATION: art resp
INGESTION: no vomit

FIRST AID SOURCE: CHRIS Manual 1991
INHALATION: remove to fresh air, give artificial respiration if needed;
call a doctor.
SKIN OR
EYES: wash eyes thoroughly with water; wash skin with water until
irritation stops.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not
breathing, give artificial respiration; if breathing is difficult, give
oxygen. In case of contact with material, immediately flush eyes with
running water for at least 15 minutes. Wash skin with soap and water.
Remove and isolate contaminated clothing and shoes at the site.

----- INITIAL INCIDENT RESPONSE -----

FIRE EXTINGUISHMENT: Alcohol foam, dry chemical, or carbon dioxide.
Note: Water may be ineffective CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport
Information - Publication DOT 5800.5 (1990).

DOT SHIPPING NAME: Methyl isobutyl ketone
DOT ID NUMBER: UN1245

ERG90

GUIDE 26

* POTENTIAL HAZARDS *

*FIRE OR EXPLOSION

Flammable/combustible material; may be ignited by heat, sparks or
flames.

Vapors may travel to a source of ignition and flash back.

Container may explode in heat of fire.

Vapor explosion hazard indoors, outdoors or in sewers.

Runoff to sewer may create fire or explosion hazard.

*HEALTH HAZARDS

May be poisonous if inhaled or absorbed through skin.

Vapors may cause dizziness or suffocation.

Fire may produce irritating or poisonous gases.

Runoff from fire control or dilution water may cause pollution.

* EMERGENCY ACTION *

Keep unnecessary people away; isolate hazard area and deny entry.

Stay upwind; keep out of low areas.

Positive pressure self-contained breathing apparatus (SCBA) and structural
firefighters' protective clothing will provide limited protection.

Isolate for 1/2 mile in all directions if tank, rail car or tank truck

is involved in fire.

CALL CHEMTREC AT 1-800-424-9300 FOR EMERGENCY ASSISTANCE. If water pollution occurs, notify the appropriate authorities.

***FIRE**

Small Fires: Dry chemical, CO2 or Halon, water spray or alcohol-resistant foam.

Large Fires: Water spray, fog or alcohol-resistant foam.

Move container from fire area if you can do it without risk.

Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks.

For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.

***SPILL OR LEAK**

Shut off ignition sources; no flares, smoking or flames in hazard area.

Stop leak if you can do it without risk.

Water spray may reduce vapors; but it may not prevent ignition in closed spaces.

Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.

Large Spills: Dike far ahead of liquid spill for later disposal.

***FIRST AID**

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen.

In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water.

Remove and isolate contaminated clothing and shoes at the site.

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NAPHTHALENE

LAST UPDATE OF THIS RECORD: 06/03/93

NAME: NAPHTHALENE

SYNONYMS: WHITE TAR; NAPHTHALIN; CAMPHOR TAR; MOTH BALLS; NCI-c52904;
NAPHTHALIN; TAR CAMPHOR

CAS: 91-20-3

RTECS: OJ0525000

FORMULA: C10H8

MOL WT: 128.18

WLN: L66J

CHEMICAL CLASS:Aromatic hydrocarbon

See other identifiers listed below under Regulations.

PROPERTIES

PHYSICAL DESCRIPTION: colorless to brown solid or molten solid with an odor of mothballs. white crystalline volatile flakes.

BOILING POINT:	491.0 K	217.8 C	424.1 F
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MELTING POINT: 353.2 K 80 C 176 F

FLASH POINT: 352 K 78.85 C 173.9 F

AUTO IGNITION: 799 K 525.8 C 1470.2 F

CRITICAL TEMP: 748.4 K 475.25 C 887.45 F

CRITICAL PRESS: 4.05 kN/M2 39.9 atm 586 psia

HEAT OF VAP: 145 Btu/lb 80.52 cal/g 3.369x E5 J/kg

HEAT OF COMB: -16720 Btu/lb -9295 cal/g -389x E5 J/kg

VAPOR PRESSURE: 1mm @ 52.6 C

UEL: 5.9 %

LEL: 0.9 %

IONIZATION POTENTIAL (eV): 8.14

VAPOR DENSITY: 4.42 (air=1)

EVAPORATION RATE: NA(n-BUTYL ACETATE=1)

SPECIFIC GRAVITY: 1.145 @ 20C

DENSITY: 1.145 g/mL @ 20 C

WATER SOLUBILITY: 0.003%

INCOMPATIBILITIES: strong oxidizers. incompatable with dinitrogen pentoxide. reacts violently with chlorine trioxide.

REACTIVITY WITH WATER: MOLTEN NAPHTHALENE SPATTERS AND FOAMS
IN CONTACT WITH WATER. NO CHEMICAL
REACTION IS INVOLVED.

REACTIVITY WITH COMMON MATERIALS: SOLUBLE IN ALCOHOL, BENZENE, ETHER,
CARBON TETRACHLORIDE, CARBON DISULFIDE,
HYDRONAPHTHALENES, FIXED AND VOLATILE
OILS. Source: SAX Source: MI

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: TOXIC VAPORS IN A FIRE
ODOR DETECTED AT (ppm): 0.03 PPM
ODOR DESCRIPTION: MOTHBALL-LIKE Source: NYDH
100 % ODOR DETECTION: No data

----- REGULATIONS -----

DOT hazard class: 4.1 FLAMMABLE SOLID
DOT guide: 32
Identification number: UN1334
DOT shipping name: Naphthalene, crude [or] refined
Packing group: III
Label(s) required: FLAMMABLE SOLID
Special provisions: A1
Packaging exceptions: 173.151
Non bulk packaging: 173.213
Bulk packaging: 173.240
Quantity limitations-
Passenger air/rail: 25 kg
Cargo aircraft only: 100 kg
Vessel stowage: A
Other stowage provisions: M2

STCC NUMBER: 4940360, 4940361

CLEAN WATER ACT Sect. 307: Yes
CLEAN WATER ACT Sect. 311: Yes
CLEAN AIR ACT: CAA '90 Listed
EPA WASTE NUMBER: U165, D001
CERCLA REF: Y
RQ DESIGNATION: B 100 pounds (45.4 kg) CERCLA
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:

Acute toxicity: Irritant
Acute toxicity: adverse effect to target organs.
Chronic toxicity: adverse effect to target organ
after long period of exposure.
Chronic toxicity: reproductive toxin.
Fire hazard: flammable.
Acute toxicity: Toxic. LD50 > 50 and <= 500
mg/kg (oral rat).

LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 1.0 percent

UNITED STATES POSTAL SERVICE MAILABILITY:

Hazard class: ORM-A
Mailability: Domestic service and air transportation; shipper's declaration
Max per parcel: 25 LBS; 5 LBS

NFPA CODES:

HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with

self-contained breathing apparatus.
FLAMMABILITY (RED) : (2) This material must be moderately heated before
ignition will occur.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

----- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON -----

ACGIH TLV list "Threshold Limit Values for 1989-1990"
California Assembly Bill 1803 Well Monitoring Chemicals.
California Assembly Bill 2588 Air Toxics "Hot Spots" Chemicals.
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act of November 15, 1990. List of pollutants.
Clean Water Act Section 307 Priority Pollutants
Clean Water Act Section 311 Hazardous Chemicals List.
DOT Hazardous Materials Table. 49 CFR 172.101
DOT Marine Pollutant. Proposed list. 57 FR 3854, Jan 31, 1992
EPA TSCA 8(d) Health and Safety Data Rule - effective date 06/01/87
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
NAPHTHALENE [91-20-3]
New Jersey DEQ100 list for release reporting.
New Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
Pennsylvania Hazardous Substance List
RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264
RCRA Hazardous Waste
SARA Section 313 Toxic Chemicals List
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
Washington State Discarded Chemical Products List, November 17, 1989
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

----- TOXICITY DATA -----

SHORT TERM TOXICITY: INHALATION: levels above 10 ppm may cause headache,
nausea, excessive sweating and vomiting. SKIN: may
cause irritation. if hypersensitive to naphthalene,
severe irritation may occur. Eyes: levels above 15 ppm
may cause irritation. direct contact may cause severe
irritation, injury to the cornea and a blurring of
vision. INGESTION: ingestion of 1/2 gram (1/60 ounce)
may cause nausea, vomiting, abdominal pain, irritation
of the bladder, and brown or black coloration of the
urine. the symptoms usually disappear after a few
days. animal studies indicate that the probable
lethal dose for an adult is 5 to 15 grams (1/16 to 1/2
ounce). (NYDH)

LONG TERM TOXICITY: repeated ingestion of 1/2 gram doses may cause clouding of the eye. inhalation of levels above 10 ppm may cause headache, nausea, vomiting and a feeling of general discomfort. chronic skin problems are rare, except in cases of hypersensitivity. (NYDH)

TARGET ORGANS: eyes, blood, liver, kidneys, skin, rbc, CNS

SYMPTOMS: Vapors or fumes are irritating to eyes, nose, and throat and may cause headaches, dizziness, nausea, etc. Solid may be irritating to skin. Source: CHRIS

CONC IDLH: 500PPM

NIOSH REL:

ACGIH TLV: TLV = 10ppm(50 mg/M3)
ACGIH STEL: STEL = 15 ppm(75 mg/M3)

OSHA PEL: Transitional Limits:
PEL = 10 ppm(50mg/M3)
Final Rule Limits:
TWA = 10 ppm (50 mg/M3)
STEL = 15 ppm(75 mg/M3)

MAK INFORMATION: 10 ppm
50 mg/M3

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:

IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)
* orl-chd LDLo:100 mg/kg 28ZRAQ -,228,60
* unr-hmn LDLo:29 mg/kg YKYUA6 31,1499,80

LD50 value: orl-rat LD50:490 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:490 mg/kg
skn-rat LD50:>2500 mg/kg
orl-mus LD50:533 mg/kg
ipr-mus LD50:150 mg/kg

scu-mus LD50:969 mg/kg
ivn-mus LD50:100 mg/kg
orl-dog LDLo:400 mg/kg
orl-cat LDLo:1 gm/kg
orl-rbt LDLo:3 gm/kg
orl-gpg LD50:1200 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):

This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

ipr-rat TDLo:5925 mg/kg (1-15D preg) TXAPA9 48,A35,79
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Cardiovascular(circulatory)system

----- EPA's IRIS DATA SUMMARY -----

Naphthalene; CASRN 91-20-3 (04/01/92)

II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Naphthalene

CASRN -- 91-20-3

Last Revised -- 12/01/90

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- D; not classifiable as to human carcinogenicity

Basis -- Based on no human data and inadequate data from animal bioassays.

II.A.2. HUMAN CARCINOGENICITY DATA

None.

II.A.3. ANIMAL CARCINOGENICITY DATA

Inadequate. The National Toxicology Program is currently evaluating naphthalene for carcinogenicity in mice by the inhalation route; final results are not yet available.

A group of 28 rats (in-house strains BDI and BDIII) was exposed to a diet supplemented with naphthalene, 6 times/week (Schmahl, 1955). Treatment was stopped when total dose was 10 g/rat. The average daily dose was approximately 10 to 20 mg/day (approximately 30 to 60 mg/kg/day). Tumors were evaluated in animals that died spontaneously at about 700 to 800 days of age. No carcinogenic responses were reported.

In a short-term pulmonary tumor bioassay, Adkins et al. (1986) exposed groups of 30 female A/J strain mice by inhalation to 0, 10, or 30 ppm naphthalene for 6 hours/day, 5 days/week for 6 months. While naphthalene caused a statistically significant increase in the number of adenomas per mouse lung, there was no apparent dose-response. This assay is considered to be a short-term, in vivo, lung tumor assay.

Tsuda et al. (1980) administered a single gavage dose of 100 mg/kg naphthalene in corn oil to a group of 10 F344 rats (sex not specified) at 12 hours after partial hepatectomy. A vehicle control group of 10 rats was included. At 2 weeks after surgery, 2-acetylaminofluorene was added to the diet at 200 ppm to inhibit proliferation of "nonresistant" hepatocytes. After 1 week of dietary 2-acetylaminofluorene, a single 2.0 mL/kg dose of carbon tetrachloride was given to necrotize "nonresistant" hepatocytes and permit proliferation of "resistant" hepatocytes. Feeding of 2-acetylaminofluorene continued for 1 week, followed by a basal diet for 1 week. The rats were then sacrificed and livers were sectioned and histochemically examined for the number and size of gamma-glutamyl transpeptidase (GGT) positive foci. These foci contain cells that are "resistant" to the necrotizing effects of carbon tetrachloride and to the proliferation-inhibiting effects of 2-acetylaminofluorene and are considered to represent an early stage in the process of neoplastic transformation. Neither the number nor the size of GGT foci appeared to be increased in naphthalene-treated rats compared with vehicle controls.

A group of 10 rats (in-house strains BDI and BDIII) received intraperitoneal injections of naphthalene (20 mg/rat) once a week for 40 weeks (Schmahl, 1955). Another group of 10 rats served as a control group. Animals were evaluated after spontaneous death. No carcinogenic responses were reported.

Coal tar-derived naphthalene that contained approximately 10% unidentified impurities was administered to 40 white rats (sex unspecified) by seven subcutaneous injections of 500 mg/kg naphthalene in sesame oil at 2-week intervals. Lymphosarcomas were found in 5/34 surviving rats at 18 months (14.7%), whereas vehicle controls had a 2% incidence of these tumors. This study is of limited value because of the presence of potentially carcinogenic impurities in the naphthalene and because prior to injection carbofuchsin was applied dermally to the injection site (Knake, 1956).

Inbred black mice (25/group) were painted with 0.5% coal tar-derived naphthalene (10% unidentified impurities) in benzene 5 days/week for life. Four treated mice developed leukemias in contrast to 0/21 vehicle controls; the untreated control incidence was 0.4%. The value of this study for assessing carcinogenicity is very limited due to the presence of potentially carcinogenic impurities. Moreover, the vehicle in the study has been shown to cause leukemias (Knake, 1956). Other mouse skin-painting tests of naphthalene as a complete carcinogen and as an initiator of carcinogenicity were negative or inconclusive (Kennaway, 1930; Schmeltz et al., 1978).

II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

With one exception naphthalene was not positive when tested in a variety of genotoxicity assays. In reverse mutation assays using *Salmonella typhimurium* strains TA97, TA98, TA100, TA1535, TA1537, TA1538, UTH8413 and UTH8414, naphthalene at concentrations of up to 2.5 mg/plate was not positive either with or without hepatic homogenates (McCann et al., 1975; Anderson and Styles, 1978; Florin et al., 1980; Gatehouse, 1980; Connor et al., 1985; Ho et al., 1981; Sakai et al., 1985; Mortelmans et al., 1986; Bos et al., 1988). Narbonne et al. (1987) reported that in the presence of hepatic homogenates naphthalene at 5 and 10 ug/plate was mutagenic for *S. typhimurium* TA1538; however, naphthalene was not positive at concentrations of 50, 100 and 1000 ug/plate. There was no increase in forward mutation frequency for *Salmonella*. At concentrations of up to 1.6 mM, naphthalene was not positive in *S. typhimurium* forward mutation assays (Kaden et al. 1979; Seixas et al., 1982). In a DNA damage assay using *S. typhimurium* TA1535 Nakamura et al. (1987) reported that naphthalene at concentrations of up to 83 ug/mL was not positive. In phage induction assays using *Escherichia coli* as a host, naphthalene at concentrations of up to 2 mg/mL did not yield positive results (Ho and Ho, 1981; Mamber et al. 1984). DNA damage assays with naphthalene were not positive in *E. coli* (Mamber et al., 1983) or in primary rat hepatocyte cultures (Sina et al., 1983). Transformation assays in Swiss mouse embryo cells (Rhim et al., 1974) and in rat embryo cells (Freeman et al., 1973) were not positive.

II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

None.

II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

None.

II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

II.D.1. EPA DOCUMENTATION

U.S. EPA. 1986. Health and Environmental Effects Profile for Naphthalene. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Solid Waste and Emergency Response, Washington, DC. Final Draft. ECAO-CIN-P192, August, 1986.

U.S. EPA. 1990. Drinking Water Criteria Document for Polycyclic Aromatic Hydrocarbons (PAHs). Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Drinking Water, Washington, DC. Final Draft. ECAO-CIN-D010, September, 1990.

II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The 1990 Drinking Water Criteria Document for Polycyclic Aromatic Hydrocarbons has undergone Agency and external review.

Agency Work Group Review: 02/07/90

Verification Date: 02/07/90

II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

Rita S. Schoeny / ORD -- (513)569-7544 / FTS 684-7544

Robert E. McGaughy / ORD -- (202)260-5889 / FTS 260-5889

PROTECTION AND FIRST AID

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

u. s. bureau of mines approved organic vapor canister unit (usbm type b);
rubber gloves; chemical safety goggles; face shield; coveralls and/or
rubber apron; rubber shoes or boots.

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:

Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:

Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:

Promptly when skin becomes contaminated.

** WORK CLOTHING SHOULD BE CHANGED DAILY:

If there is any reasonable possibility that the clothing may be contaminate

** REMOVE CLOTHING:

Promptly remove non-impervious clothing that becomes contaminated.

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (NAPHTHALENE)

100 ppm: Any chemical cartridge respirator with organic vapor
cartridge(s) in combination with a dust and mist filter. * Substance
reported to cause eye irritation or damage may require eye protection. /
Any supplied-air respirator. * Substance reported to cause eye irritation
or damage may require eye protection. / Any self-contained breathing
apparatus. * Substance reported to cause eye irritation or damage may
require eye protection.

250 ppm: Any supplied-air respirator operated in a continuous flow mode.
* Substance reported to cause eye irritation or damage may require eye
protection. / Any powered air-purifying respirator with organic vapor
cartridge(s) in combination with a dust and mist filter. * Substance
reported to cause eye irritation or damage may require eye protection.

500 ppm: Any chemical cartridge respirator with a full facepiece and
organic vapor cartridge(s). / Any air-purifying respirator with a
high-efficiency particulate filter. / Any supplied-air respirator with a
full facepiece. / Any self-contained breathing apparatus with a full
facepiece.

EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.:
Any self-contained breathing apparatus with full facepiece and operated
in a pressure-demand or other positive pressure mode. / Any supplied-air
respirator with a full facepiece and operated in pressure-demand or other
positive pressure mode in combination with an auxiliary self-contained
breathing apparatus operated in pressure-demand or other positive
pressure mode.

ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a

chin-style or front- or back-mounted organic vapor canister having a high-efficiency particulate filter. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: CHRIS Manual 1991

INHALATION: remove to fresh air.

SKIN OR

EYES: flush immediately with plenty of water for at least 15 min.; remove contaminated clothing immediately; call a physician.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.

Move victim to fresh air; call emergency medical care. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Removal of solidified molten material from skin requires medical assistance. Remove and isolate contaminated clothing and shoes at the site.

----- INITIAL INCIDENT RESPONSE -----

FIRE EXTINGUISHMENT: Water fog, carbon dioxide, dry chemical, or foam.
CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).

DOT SHIPPING NAME: Naphthalene, crude [or] refined

DOT ID NUMBER: UN1334

ERG90

GUIDE 32

* POTENTIAL HAZARDS *

*FIRE OR EXPLOSION

Flammable/combustible material; may be ignited by heat, sparks or flames.

May burn rapidly with flare-burning effect.

*HEALTH HAZARDS

Fire may produce irritating or poisonous gases.

Contact may cause burns to skin and eyes.

Runoff from fire control or dilution water may cause pollution.

* EMERGENCY ACTION *

Keep unnecessary people away; isolate hazard area and deny entry.

Stay upwind; keep out of low areas.

Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection.

CALL CHEMTREC AT 1-800-424-9300 FOR EMERGENCY ASSISTANCE. If water pollution occurs, notify the appropriate authorities.

*FIRE

Small Fires: Dry chemical, sand, earth, water spray or regular foam.

Large Fires: Water spray, fog or regular foam.

Move container from fire area if you can do it without risk.

Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks.

For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn.
Magnesium Fires: Use dry sand, Met-L-X R powder or G-1 graphite powder.

***SPILL OR LEAK**

Shut off ignition sources; no flares, smoking or flames in hazard area.
Do not touch or walk through spilled material.

Small Dry Spills: With clean shovel place material into clean, dry container and cover loosely; move containers from spill area.

Large Spills: Wet down with water and dike for later disposal.

***FIRST AID**

Move victim to fresh air; call emergency medical care.

In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes.

Removal of solidified molten material from skin requires medical assistance.

Remove and isolate contaminated clothing and shoes at the site.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.

The COMPILERS of the CHEMTOX database shall not be held liable for inaccuracies or omissions within this database, or in any of its printed or displayed output forms.

PHENANTHRENE

CHEMTOX DATA

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----- IDENTIFIERS -----

CHEMTOX RECORD 313

LAST UPDATE OF THIS RECORD: 06/03/93

NAME: PHENANTHRENE
SYNONYMS: PHENANTHREN (German)
CAS: 85-01-8 RTECS: SF7175000
FORMULA: C14H10 MOL WT:
WLN: L B666J
CHEMICAL CLASS:

See other identifiers listed below under Regulations.

----- PROPERTIES -----

PHYSICAL DESCRIPTION:

BOILING POINT: 613.16 K 340 C 644 F
MELTING POINT: 372.16-374.16 K 99-101 C 210.2-213.8 F
FLASH POINT: NA
AUTO IGNITION: NA
VAPOR PRESSURE:
UEL: NA
LEL: NA
VAPOR DENSITY: No data
SPECIFIC GRAVITY: No data
DENSITY:
WATER SOLUBILITY:
INCOMPATIBILITIES:

REACTIVITY WITH WATER: No data on water reactivity
REACTIVITY WITH COMMON MATERIALS: No data
STABILITY DURING TRANSPORT: No Data
NEUTRALIZING AGENTS: No data
POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible
unburned vapors
ODOR DETECTED AT (ppm): Unknown
ODOR DESCRIPTION: No data
100 % ODOR DETECTION: No data

----- REGULATIONS -----

DOT hazard class: 9 CLASS 9
DOT guide: 31
Identification number: UN3077
DOT shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCES, SOLID,
N.O.S. (PHENANTHRENE)
Packing group: III
Label(s) required: CLASS 9

Special provisions: 8, B54
Packaging exceptions: 173.155
Non bulk packaging: 173.213
Bulk packaging: 173.240
Quantity limitations-
Passenger air/rail: NONE
Cargo aircraft only: NONE
Vessel stowage: A
Other stowage provisions:

STCC NUMBER: Not listed

CLEAN WATER ACT Sect.307:Yes
CLEAN WATER ACT Sect.311:No
CLEAN AIR ACT: Not listed
EPA WASTE NUMBER: None
CERCLA REF: Not listed
RQ DESIGNATION: D 5000 pounds (2270 kg) CERCLA
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:

Acute toxicity: Irritant
Chronic toxicity: mutagen.

UNITED STATES POSTAL SERVICE MAILABILITY:
Not given

NFPA CODES:
HEALTH HAZARD (BLUE): Unspecified
FLAMMABILITY (RED) : Unspecified
REACTIVITY (YELLOW): Unspecified
SPECIAL : Unspecified

----- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON -----

California Assembly Bill 1803 Well Monitoring Chemicals.
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Water Act Section 307 Priority Pollutants
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
New Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
PHENANTHRENE [85-01-8]
Pennsylvania Hazardous Substance List
RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)

----- TOXICITY DATA -----

SHORT TERM TOXICITY: Unknown

LONG TERM TOXICITY: photosensitizes skin and may be carcinogenic. **
source: ■sax

TARGET ORGANS:

SYMPTOMS: Source:

CONC IDLH: Unknown

NIOSH REL: Not given

ACGIH TLV: Not listed

ACGIH STEL: Not listed

OSHA PEL: Transitional Limits:

PEL = 0.2mg/M3

Final Rule Limits:

TWA = 0.2 mg/M3

MAK INFORMATION: Not listed

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:

IARC: Not classified as to human
carcinogenicity or probably not
carcinogenic to humans.

MAK: Not listed

NIOSH: Not listed

NTP: Not listed

ACGIH: Not listed

OSHA: Not listed

LD50 value: No LD50 in RTECS 1992

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-mus LD50:700 mg/kg

ipr-mus LD50:700 mg/kg

ivn-mus LD50:56 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):

This chemical has no known mammalian reproductive toxicity.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

----- EPA's IRIS DATA SUMMARY -----

Phenanthrene; CASRN 85-01-8 (04/01/92)

_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Phenanthrene

CASRN -- 85-01-8

Last Revised -- 12/01/90

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

_II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

___II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- D, not classifiable as to human carcinogenicity

Basis -- Based on no human data and inadequate data from a single gavage study in rats and skin painting and injection studies in mice.

___II.A.2. HUMAN CARCINOGENICITY DATA

None.

___II.A.3. ANIMAL CARCINOGENICITY DATA

Inadequate. Data from a rat gavage study and mouse skin application and injection studies are not adequate to assess the carcinogenicity of phenanthrene. Ten female Sprague-Dawley rats received a single oral dose of 200 mg phenanthrene in sesame oil (Huggins and Yang, 1962). No mammary tumors

occurred. The observation period was not specified; however, based on the discussion of other experiments in the report it was probably at least 60 days. Controls were not reported.

Complete carcinogenic activity was not shown in two skin painting assays. Kennaway (1924) reported no tumors in 100 mice (strain and sex not specified) treated with phenanthrene (purity not specified) in 90% benzene (dose not reported) for 9 months. Roe and Grant (1964) reported in an abstract that mice (number, sex and strain not specified) did not develop tumors after dermal exposure to 5% phenanthrene (purity not specified, vehicle not specified) 3 times/week for 1 year.

Five studies of cancer-initiating activity in skin painting assays in mice have yielded one positive result. Groups of 30 female CD-1 mice received a single dermal application of 1.8 mg phenanthrene in benzene, followed by twice-weekly applications of tetradecanoylphorbol acetate (TPA, 3 mg), a promoter, for 35 weeks (Scribner, 1973). Phenanthrene used in the study was purified by preparative thin-layer chromatography (TLC) and determined to be homogeneous on TLC. It is stated in the report that the dose of TPA was 3 mg (5 umol); however, it is not clear whether this refers to the twice weekly or total dose. Controls were treated with TPA (6 mg); it is not clear whether controls received benzene (vehicle). The tumor incidence (skin papilloma) at 35 weeks was 12/30 (40%) in treated mice and 0/30 in TPA controls.

Tumor-initiating activity was not shown in the four other mouse skin painting studies. In the first study, male Swiss albino (Ha/ICR) mice (15 to 20/group) received 10 applications of a 0.1% solution of phenanthrene in acetone (total dose 1 mg) or acetone alone, followed by repeated applications of TPA (2.5 ug in acetone) 3 times/week for 20 weeks (LaVoie et al., 1981). Phenanthrene was >99.5% pure as determined by high pressure liquid chromatography (HPLC). No tumors occurred in treated or control mice. Wood et al. (1979) exposed female CD-1 mice (30/group) to a single application of 1.8 mg phenanthrene in acetone:ammonium hydroxide (1000:1) or vehicle alone, followed by TPA (10 ug) twice weekly for 35 weeks. Phenanthrene used in this study was >98% pure and homogeneous on HPLC. Tumor incidence (skin papillomas) out of 27-29 survivors in each group was 17% in treated mice and 7% in vehicle controls (not statistically different). In another study, albino mice (10/sex/dose, strain not specified) received four dermal applications of phenanthrene (total dose 1.2 mg, purity not specified) in acetone or to acetone alone, followed by croton oil once each week for 20 weeks (Roe, 1962). Tumor incidence (skin papillomas) was 4/19 (21%) in treated mice and 2/20 (10%) in vehicle controls. In the last study (Salaman and Roe, 1956), groups of 20 "S" strain mice (sex unspecified) received 10 dermal applications (3 times/week) of 18% phenanthrene (total dose 0.54 g, purity not specified) in acetone, followed by 18 weekly applications of croton oil. Controls were treated with 18 applications of croton oil; 10 controls survived until termination. The tumor incidence (skin papillomas) was 5/20 (25%) in treated mice and 4/10 (40%) in croton oil controls.

Parenterally administered phenanthrene was not shown to have tumorigenic activity in three studies. In the first (Buening et al., 1979), groups of Swiss Webster BLU:Ha ICR mice (100/group, approximately 50% of each sex) received intraperitoneal injections of phenanthrene (total dose 0.25 mg) in

dimethyl sulfoxide (DMSO) or DMSO alone on days 1, 8, and 15 after birth. Phenanthrene was >98% pure and homogeneous on HPLC. Incidence of pulmonary tumors (adenomas) at 38 to 42 weeks was 1/18 (6%) and 5/17 (30%) in female and male treated mice and 7/38 (18%) and 2/10 (19%) in female and male controls; the apparent differences were not statistically significant. No hepatic tumors occurred in treated or control mice. One treated female mouse developed malignant lymphoma. In the second study (Grant and Roe, 1963), albino mice (sex, strain and group size not specified) received single subcutaneous injections of phenanthrene (40 ug, purity not specified) in an acetone/gelatin vehicle or only the vehicle. Incidence of pulmonary adenomas after 52-62 weeks was 3/39 (6%) in treated mice and 8/34 (24%) in vehicle controls. Other tumors reported were 4 hepatomas and 2 skin papillomas in treated mice, and 1 mammary adenocarcinoma, 1 hepatoma and 1 hemangioma in control mice. Finally in the Steiner (1955) study, groups of 40 to 50 male and female C57BL mice (numbers per sex not specified) received single subcutaneous injections of 5 mg phenanthrene (purity not specified) in tricapylin. No tumors were reported in 27 surviving mice after 4 months. Vehicle controls were not reported.

II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

Phenanthrene has not yielded positive results in assays for DNA damage in *Bacillus subtilis* and *Escherichia coli* (Rosenkrantz and Poirier, 1979; McCarroll et al., 1981). Tests for mutagenicity in *Salmonella typhimurium* have yielded positive (Oesch et al., 1981; Sakai et al., 1985; Bos et al., 1988) and negative results (Wood et al., 1979; McCann et al., 1975; LaVoie et al., 1981; Kaden et al., 1979; Bos et al., 1988). The results of phenanthrene in a fungi recombination assay (Simmon, 1979) and in tests for DNA damage in several mammalian cell cultures were not positive (Lake et al., 1978; Probst et al., 1981; Rice et al., 1984). A test for forward mutation in Chinese hamster ovary cells exposed to 1 ug/mL was not positive (Huberman and Sachs, 1976), whereas a test in human lymphoblast TK6 cells incubated with rat liver S9 (Arochlor) and 9 ug/mL phenanthrene yielded positive results (Barfknecht et al., 1981). Phenanthrene did not yield positive results in sister chromatid exchange and chromosome aberration assays in mammalian cell cultures (Popescu et al., 1977) or in cell transformation assays in several types of mammalian cells (5-40 ug/mL) (Marquardt and Heidelberger, 1972; Kakunaga, 1973; Evans and DiPaolo, 1975; Pienta et al., 1977).

Current theories regarding the mechanisms of metabolic activation of polycyclic aromatic hydrocarbons lead to predictions of a carcinogenic potential for phenanthrene. Jerina et al. (1978) considered phenanthrene to have a "bay-region" structure. It is metabolized by mixed function oxidases to reactive diol epoxides (Nordqvist et al., 1981; Vyas et al., 1982) that have been shown to be weakly mutagenic in some bacterial and mammalian cell assays (Wood et al., 1979). Evidence from in vivo assays indicates, however, that phenanthrene metabolites have a relatively low tumorigenic potential. The 1,2-, 3,4- and 9,10-dihydrodiol metabolites of phenanthrene did not show tumor initiating activity in mouse skin painting assays (Wood et al., 1979). The 1,2-diol-3,4-epoxides of phenanthrene did not produce lung tumors when injected into newborn mice (Buening et al., 1979). The relatively weak

mutagenic and tumorigenic activity of phenanthrene diol epoxides is inconsistent with the "bay region theory" of PAH carcinogenesis. The reason for the inconsistency has not been elucidated. Phenanthrene epoxides have a relatively small molecular size (relative to other more active PAH epoxides such as chrysene diol epoxides) and as a result may have a lower affinity for DNA or may be transported less efficiently into the mammalian nucleus (Wood et al., 1979). While some studies have considered phenanthrene to have a "bay-region" structure, it may not clearly fall into this category.

__II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

None.

__II.C. QUANTITATIVE ESTIMATE OF RISK FROM INHALATION EXPOSURE

None.

) __II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

The 1990 Drinking Water Criteria Document for Polycyclic Aromatic Hydrocarbons (PAHs) has received Agency and external review.

__II.D.1. EPA DOCUMENTATION

U.S. EPA. 1990. Drinking Water Criteria Document for Polycyclic Aromatic Hydrocarbons (PAHs). Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Drinking Water, Washington, DC. Final Draft. ECAO-CIN-D010, September, 1990.

__II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The 1990 Drinking Water Criteria Document for Polycyclic Aromatic Hydrocarbons has received Agency and external review.

Agency Work Group Review: 02/07/90, 05/03/90

Verification Date: 05/03/90

II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

Rita Schoeny / ORD -- (513)569-7544 / FTS 684-7544

Robert McGaughy / ORD -- (202)260-5889 / FTS 260-5889

----- PROTECTION AND FIRST AID -----

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

FIRST AID SOURCE: DOT Emergency Response Guide 1990.

In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

----- INITIAL INCIDENT RESPONSE -----

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).

DOT SHIPPING NAME: ENVIRONMENTALLY HAZARDOUS SUBSTANCES, SOLID, N.O.S. (PHENANT
DOT ID NUMBER: UN3077

ERG90

GUIDE 31

* POTENTIAL HAZARDS *

*FIRE OR EXPLOSION

Some of these materials may burn, but none of them ignites readily.

*HEALTH HAZARDS

Contact may cause burns to skin and eyes.

Fire may produce irritating or poisonous gases.

Runoff from fire control or dilution water may cause pollution.

* EMERGENCY ACTION *

Keep unnecessary people away; isolate hazard area and deny entry.

Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection.

CALL CHEMTREC AT 1-800-424-9300 FOR EMERGENCY ASSISTANCE. If water pollution occurs, notify the appropriate authorities.

*FIRE

Small Fires: Dry chemical, CO2, water spray or regular foam.

Large Fires: Water spray, fog or regular foam.

Move container from fire area if you can do it without risk.

Do not scatter spilled material with high-pressure water streams.

Dike fire-control water for later disposal.

***SPILL OR LEAK**

Stop leak if you can do it without risk.

Small Dry Spills: With clean shovel place material into clean, dry container and cover loosely; move containers from spill area.

Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.

Large Spills: Dike far ahead of liquid spill for later disposal.

Cover powder spill with plastic sheet or tarp to minimize spreading.

***FIRST AID**

In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water.

Remove and isolate contaminated clothing and shoes at the site.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.

The COMPILERS of the CHEMTOX database shall not be held liable for inaccuracies or omissions within this database, or in any of its printed or displayed output forms.

POLYCHLORINATED BIPHENYLS
(PCBs)

CHEMTOX DATA

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----- IDENTIFIERS -----

CHEMTOX RECORD 323

LAST UPDATE OF THIS RECORD: 06/03/93

NAME: POLYCHLORINATED BIPHENYL(S) (PCBS)
SYNONYMS: AROCLOR; AROCLOR 1221; AROCLOR 1232; AROCLOR 1242; AROCLOR 1248; AROCLOR 1254; AROCLOR 1260; AROCLOR 1262; AROCLOR 1268; AROCLOR 2565; AROCLOR 4465; BIPHENYL, POLYCHLORO-; CHLOPHEN; CHLOREXTOL; CHLORINATED BIPHENYL; CHLORINATED DIPHENYL; CHLORINATED DIPHYLENE; CHLORO BIPHENYL; CHLORO 1,1-BIPHENYL; CLOPHEN; DYKANOL; FENCLOL; INERTEEN; KANECHLOR; KANECHLOR 300; KANECHLOR 400; KANECHLOR 500; MONTAR; NOFLAMOL; PCB; PCBs; PHENOCHLOR; PHENOCLOL; POLYCHLORINATED BIPHENYL; POLYCHLOROBIPHENYL; PYRALENE; PYRANOL; SANTOTHERM; SANTOTHERM FR; SOVOL; THERMINOL FR-1; POLYCHLORINATED BIPHENYLS; PCB'S; 1,1'-BIPHENYL CHLORO DERIVS; 1,1'-BIPHENYL, CHLORO DERIVS.; AROCLOR - POLYCHLORINATED BIPHENYL; POLYCHLORINATED BIPHENYLS (PBB'S)

CAS: 1336-36-3

RTECS: TQ1350000

FORMULA:

MOL WT:

WLN:

CHEMICAL CLASS: Halogenated h-carbon

See other identifiers listed below under Regulations.

----- PROPERTIES -----

PHYSICAL DESCRIPTION: light yellow oily liquid or white solid powder with a weak odor

BOILING POINT: NA
MELTING POINT: NA
'FPF.DICT' LINE 10. [B16] Non-numeric data when numeric required. Zero used.
'FPC.DICT' LINE 10. [B16] Non-numeric data when numeric required. Zero used.
FLASH POINT: 468.15 K -273.15 C -459.7 F
AUTO IGNITION: NA
VAPOR PRESSURE:
UEL: na
LEL: na
VAPOR DENSITY: No data
SPECIFIC GRAVITY: 1.3 - 1.8@ 20C
DENSITY: 1.3 g/cc or 12.09 lb/gal
WATER SOLUBILITY:
INCOMPATIBILITIES:

REACTIVITY WITH WATER: No data on water reactivity
REACTIVITY WITH COMMON MATERIALS: No data
STABILITY DURING TRANSPORT: No Data
NEUTRALIZING AGENTS: No data
POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors

ODOR DETECTED AT (ppm): Data not available
ODOR DESCRIPTION: Practically odorless Source:CHRIS
100 % ODOR DETECTION: No data

----- REGULATIONS -----

DOT hazard class: 9 CLASS 9
DOT guide: 31
Identification number: UN2315
DOT shipping name: Polychlorinated biphenyls
Packing group: II
Label(s) required: CLASS 9
Special provisions: 9
Packaging exceptions: 173.155
Non bulk packaging: 173.202
Bulk packaging: 173.240
Quantity limitations-
Passenger air/rail: 100 L
Cargo aircraft only: 220 L
Vessel stowage: A
Other stowage provisions: 34, M1

STCC NUMBER: 4961666

CLEAN WATER ACT Sect.307:No
CLEAN WATER ACT Sect.311:Yes
National Primary Drinking Water Regulations
Maximum Contaminant Levels (MCL): 0.0005 mg/L (07/30/92)
Maximum Contaminant Level Goals (MCLG): 0 mg/L (07/30/92)

CLEAN AIR ACT: CAA '90 Listed
EPA WASTE NUMBER: None
CERCLA REF: Y
RQ DESIGNATION: X 1 pound (0.454 kg) CERCLA
SARA TPQ VALUE: Not listed
SARA Sect. 312

categories:

Chronic toxicity: carcinogen
Chronic toxicity: adverse effect to target organ
after long period of exposure.
Chronic toxicity: reproductive toxin.

LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 0.1 percent

UNITED STATES POSTAL SERVICE MAILABILITY:
Not given

NFPA CODES:
HEALTH HAZARD (BLUE): Unspecified
FLAMMABILITY (RED) : Unspecified

REACTIVITY (YELLOW): Unspecified
SPECIAL : Unspecified

----- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON -----

California Assembly Bill 1803 Well Monitoring Chemicals.
California Assembly Bill 2588 Air Toxics "Hot Spots" Chemicals.
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act of November 15, 1990. List of pollutants.
Clean Water Act Section 311 Hazardous Chemicals List.
DOT Hazardous Materials Table. 49 CFR 172.101
EPA Carcinogen Assessment Group List
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Section 12(b) Export Rule Notification.
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
National Toxicology Program list of anticipated human carcinogens
New Jersey DEQ100 list for release reporting.
New Jersey Right To Know Substance List. (December 1987)
New Jersey Right to Know Substance List. Listed as a carcinogen.
New Jersey Right to Know Substance List. Listed as a teratogen.
POLYCHLORINATED BIPHENYL(S) (PCBS) [1336-36-3]
Pennsylvania Hazardous Substance List
SARA Section 313 Toxic Chemicals List
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

----- TOXICITY DATA -----

SHORT TERM TOXICITY: Unknown

LONG TERM TOXICITY: unknown

TARGET ORGANS: skin, liver

SYMPTOMS: Acne from skin contact. Source: CHRIS

CONC IDLH: Unknown

NIOSH REL: Not given

ACGIH TLV: Not listed

ACGIH STEL: STEL = 2 ppm

OSHA PEL: Not in Table Z-1-A

MAK INFORMATION: Not listed

CARCINOGEN?: Y STATUS: See below

CARCINOGEN LISTS:

IARC: Carcinogen defined by IARC
to be probably carcinogenic to
humans with (usually) at least
limited human evidence.
MAK: Not listed
NIOSH: Carcinogen defined by NIOSH
with no further categorization.
NTP: Carcinogen defined by NTP as
reasonably anticipated to be
carcinogenic, with limited
evidence in humans or sufficient
evidence in experimental animals.
ACGIH: Not listed
OSHA: Not listed

LD50 value: No LD50 in RTECS 1992

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-mus LD50:1900 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):

This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

orl-rat TDLo:400 mg/kg (6-15D preg) FAATDF 11,440,88
EFFECTS ON NEWBORN
Behavioral

orl-rat TDLo:420 mg/kg (21D post) FAATDF 11,440,88
EFFECTS ON NEWBORN
Behavioral

orl-rat TDLo:247 mg/kg (60D pre-22D post) FAATDF
15,457,90
EFFECTS ON NEWBORN
Behavioral

ipr-rat TDLo:700 mg/kg (14D pre) FAATDF 11,440,88
EFFECTS ON NEWBORN
Behavioral

orl-mam TDLo:325 mg/kg (30D pre/1-36D preg) AMBOCX
6,239,77
EFFECTS ON NEWBORN
Stillbirth
EFFECTS ON NEWBORN

Live birth index(# fetuses per liter)
EFFECTS ON NEWBORN
Viability index(# alive at day 4 per # born alive)

NO SIGNIFICANT

RISK LEVEL(Ca P65): NO.09 micrograms/day

----- EPA's IRIS DATA SUMMARY -----
Polychlorinated biphenyls (PCBs); CASRN 1336-36-3 (04/01/92)

II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Polychlorinated biphenyls (PCBs)
CASRN -- 1336-36-3
Last Revised -- 01/01/90

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- B2; probable human carcinogen

Basis -- hepatocellular carcinomas in three strains of rats and two strains of mice and inadequate yet suggestive evidence of excess risk of liver cancer in humans by ingestion and inhalation or dermal contact.

II.A.2. HUMAN CARCINOGENICITY DATA

Inadequate. Although there are many studies, the data are inadequate due to confounding exposures or lack of exposure quantification. The first documentation of carcinogenicity associated with PCB exposure was reported at a New Jersey petrochemical plant involving 31 research and development employees and 41 refinery workers (Bahn et al., 1976, 1977). Although a

statistically significant increase in malignant melanomas was reported, the two studies failed to report a quantified exposure level and to account for the presence of other potential or known carcinogens. In an expanded report of these studies, NIOSH (1977) concurred with the Bahn et al. (1976) findings. Brown and Jones (1981) reported a retrospective cohort mortality study on 2567 workers who had completed at least 3 months of employment at one or two capacitor manufacturing plants. Exposure levels were 24-393 mg/cu.m at plant A and 318-1260 mg/cu.m at plant B. No excess risk of cancer was observed. In a 7-year follow-up study, Brown (1987) reported a statistically significant excess risk of liver and biliary cancer, with four of the five liver cancers in female workers at plant B. A review of the pathology reports indicated that two of the liver tumors counted in the follow-up study were not primary liver tumors. When these tumors are excluded the elevation in incidence is not statistically significant. The results also may be confounded by population differences in alcohol consumption, dietary habits, and ethnic composition.

Bertazzi et al. (1987) conducted a mortality study of 544 male and 1556 female employees of a capacitor-making facility in Northern Italy. Aroclor 1254 and Pyralene 1476 were used in this plant until 1964. These were progressively replaced by Pyralenes 3010 and 3011 until 1970, after which lower chlorinated Pyralenes were used exclusively. In 1980 the use of PCBs was abandoned. Some employees also used trichloroethylene but, according to the authors, were presumed to be protected by efficient ventilation. Air samples were collected and analyzed for PCBs in 1954 and 1977 because of reports of chloracne in workers. Quantities of PCBs on workers' hands and workplace surfaces also were measured in 1977. In 18 samples, levels ranged from 0.2-159.0 ug/sq.m on workplace surfaces and 0.3-9.2 ug/sq.m on workers' hands.

The authors compared observed mortality with that expected between 1946 and 1982 based on national and local Italian mortality rates. With vital status ascertainment 99.5% complete, relatively few deaths were reported by 1982 [30 males (5.5%) and 34 females (2.2%)]. In cohort males, the number of deaths from malignant tumors was significantly higher than expected compared with local or national rates, as was the number of deaths from cancer of the GI tract (6 observed vs. 1.7 national expected and 2.2 local expected). Of the six GI cancer deaths, one was due to liver cancer and one to biliary tract cancer. Deaths from hematologic neoplasms in males were also higher than expected, but the excess was not statistically significant. Total cancer deaths in females were significantly elevated in comparison to local rates (12 observed vs. 5.3 expected). None of these were liver or biliary cancers. The number of deaths from hematologic neoplasms in females was higher than expected when compared with local rates (4 observed vs. 1.1 expected). This study is limited by several factors, particularly the small number of deaths that occurred by the cut-off period. The power of the study is insufficient to detect an elevated risk of site-specific cancer. In addition, the authors stated, after an examination of the individual cases, that interpretation of the increase in GI tract cancer in males was limited, as it appeared likely that some of these individuals had only limited PCB exposure. Confounding factors may have included possible contamination of the PCBs by dibenzofurans and exposure of some of the workers to trichloroethylene, alkylbenzene, and epoxy resins.

Two occurrences of ingestion of PCB-contaminated rice oil have been reported: the Yusho incident of 1968 in Japan and the Yu-Cheng incident of 1979 in Taiwan. Amano et al. (1984) completed a 16-year retrospective cohort mortality study of 581 male and 505 female victims of the Yusho incident. A consistently high risk of liver cancer in females over the entire 16 years was observed; liver cancer in males was also significantly increased. Several serious limitations are evident in this study. There was a lack of information regarding job histories or the influence of alcoholism or smoking. The information concerning the diagnosis of liver cancer was obtained from the victims' families, and it is not clear whether this information was independently verified by health professionals. For some of the cancers described, the latency period is shorter than would be expected. Furthermore, the contaminated oils contained polychlorinated dibenzofurans and polychlorinated quinones as well as PCBs, and the study lacks data regarding exposure to the first two classes of compounds. There is strong evidence indicating that the health effects seen in Yusho victims were due to ingestion of polychlorinated dibenzofurans, rather than to PCBs themselves (reviewed in EPA, 1988). The results of the Amano et al. study can, therefore, be considered as no more than suggestive of carcinogenicity of PCBs.

II.A.3. ANIMAL CARCINOGENICITY DATA

Sufficient. PCB mixtures assayed in the following studies were commercial preparations and may not be the same as mixtures of isomers found in the environment. Although animal feeding studies demonstrate the carcinogenicity of commercial PCB preparations, it is not known which of the PCB congeners in such preparations are responsible for these effects, or if decomposition products, contaminants or metabolites are involved in the toxic response. Early bioassays with rats (Kimura and Baba, 1973; Ito et al., 1974) were inadequate to assess carcinogenicity due to the small number of animals and short duration of exposure to PCB. A long-term bioassay of Aroclor 1260 reported by Kimbrough et al. (1975) produced hepatocellular carcinomas in female Sherman rats when 100 ppm was administered for 630 days to 200 animals. Hepatocellular carcinomas and neoplastic nodules were observed in 14 and 78%, respectively, of the dosed animals, compared with 0.58 and 0%, respectively, of the controls.

The NCI (1978) reported results for 24 male and 24 female Fischer 344 rats treated with Aroclor 1254 at 25, 50, or 100 ppm for 104 to 105 weeks. Although carcinomas of the gastrointestinal tract were observed among the treated animals only, the incidence was not statistically significantly elevated. An apparent dose-related incidence of hepatic nodular hyperplasia in both sexes as well as hepatocellular carcinomas among mid- to high-dose treated males was reported (4-12%, compared to 0% in controls).

Norback and Weltman (1985) fed 70 male and 70 female Sprague-Dawley rats a diet containing Aroclor 1260 in corn oil at 100 ppm for 16 months, followed by a 50 ppm diet for an additional 8 months, then a basal diet for 5 months. Control animals (63 rats/sex) received a diet containing corn oil for 18 months, then a basal diet alone for 5 months. Among animals that survived for

at least 18 months, females exhibited a 91% incidence (43/47) of hepatocellular carcinoma. An additional 4% (2/47) had neoplastic nodules. Males corresponding incidences were 4% (2/46) for carcinoma and 11% (5/46) for neoplastic nodules. Concurrent liver morphology studies were carried out on tissue samples obtained by partial hepatectomies of three animals/group at eight time points. These studies showed the sequential progression of liver lesions to hepatocellular carcinomas.

Orally administered PCB resulted in increased incidences of hepatocellular carcinomas in two mouse strains. Ito et al. (1973) treated male dd mice (12/group) with Kanechlors 500, 400 and 300 each at dietary levels of 100, 250 or 500 ppm for 32 weeks. The group fed 500 ppm of Kanechlor 500 had a 41.7% incidence of hepatocellular carcinomas and a 58.3% incidence of nodular hyperplasia. Hepatocellular carcinomas and nodular hyperplasia were not observed in mice fed 100 or 250 ppm of Kanechlor 500, nor among those fed Kanechlors 400 or 300 at any concentrations.

Schaeffer et al. (1984) fed male Wistar rats diets containing 100 ppm of the PCB mixtures Clophen A 30 (30% chlorine by weight) or Clophen A 60 (60% chlorine by weight) for 800 days. The PCB mixtures were reported to be free of furans. Clophen A 30 was administered to 152 rats, Clophen A 60 to 141 rats, and 139 rats received a standard diet. Mortality and histologic lesions were reported for animals necropsied during each 100-day interval for all three groups. Of the animals that survived the 800-day treatment period, 1/53 rats (2%) in the control group, 3/87 (3%) in the Clophen A 30 group and 52/85 (61%) in the Clophen A 60 group had developed hepatocellular carcinoma. The incidence in the Clophen A 60 group was significantly elevated in comparison to the control group. Neoplastic nodules were reported in 2/53 control, 35/87 Clophen A 30, and 34/85 Clophen A 60-treated animals. The incidence of nodules was significantly increased in both treatment groups in comparison to the control group. Neoplastic liver nodules and hepatocellular carcinomas appeared earlier and at higher incidence in the Clophen A 60 group relative to the Clophen A 30 group. The authors interpreted the results as indicative of a carcinogenic effect related to the degree of chlorination of the PCB mixture. The authors also suggested that these findings support those of others, including Ito et al. (1973) and Kimbrough et al. (1975), in which hepatocellular carcinomas were produced by more highly chlorinated mixtures.

Kimbrough and Linder (1974) dosed groups of 50 male BALB/cJ mice (a strain with a low spontaneous incidence of hepatoma) with Aroclor 1254 at 300 ppm in the diet for 11 months or 6 months, followed by a 5-month recovery period. Two groups of 50 mice were fed a control diet for 11 months. The incidence of hepatomas in survivors fed Aroclor 1254 for 11 months was 10/22. One hepatoma was observed in the 24 survivors fed Aroclor 1254 for 6 months.

II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

Most genotoxicity assays of PCBs have been negative. The majority of microbial assays of PCB mixtures and various congeners showed no evidence of mutagenic effects (Schoeny et al., 1979; Schoeny, 1982; Wyndham et al., 1976). Of various tests on the clastogenic effect of PCBs (Heddle and Bruce, 1977;

Green et al., 1975), only Peakall et al. (1972) reported results indicative of a possible clastogenic action by PCBs in dove embryos.

Chlorinated dibenzofurans (CDFs), known contaminants of PCBs, and chlorinated dibenzodioxins (CDDs) are structurally related to and produce certain biologic effects similar to those of PCB congeners. While the CDDs are known to be carcinogenic, the carcinogenicity of CDFs is still under evaluation.

__II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

__II.B.1. SUMMARY OF RISK ESTIMATES

Oral Slope Factor -- 7.7/mg/kg/day

Drinking Water Unit Risk -- 2.2E-4/ug/L

Extrapolation Method -- Linearized multistage procedure, extra risk

Drinking Water Concentrations at Specified Risk Levels:

Risk Level	Concentration
-----	-----
E-4 (1 in 10,000)	5E-1 ug/L
E-5 (1 in 100,000)	5E-2 ug/L
E-6 (1 in 1,000,000)	5E-3 ug/L

__II.B.2. DOSE-RESPONSE DATA (CARCINOGENICITY, ORAL EXPOSURE)

Tumor Type -- trabecular carcinoma/adenocarcinoma, neoplastic nodule

Test Animals -- rat/Sprague-Dawley, female

Route -- diet

Reference -- Norback and Weltman, 1985

Administered Dose (mg/kg)/day (TWA)	Human Equivalent Dose (mg/kg)/day	Tumor Incidence
-----	-----	-----
0	0	1/49
3.45	0.59	45/47

__II.B.3. ADDITIONAL COMMENTS (CARCINOGENICITY, ORAL EXPOSURE)

Human equivalent dosage assumes a TWA daily dose of 3.45 mg/kg/day. This reflects the dosing schedule of 5 mg/kg/day (assuming the rat consumes an

amount equal to 5% of its bw/day) for the first 16 months, 2.5 mg/kg/day for the next 8 months, and no dose for the last 5 months.

A slope factor of 3.9/mg/kg/day was based on data from the Kimbrough et al. (1975) study of female Sherman rats fed Aroclor 1260. The estimate based on the data of Norback and Weltman (1985) is preferred because Sprague-Dawley rats are known to have low incidence of spontaneous hepatocellular neoplasms. Moreover, the latter study spanned the natural life of the animal, and concurrent morphologic liver studies showed the sequential progression of liver lesions to hepatocellular carcinomas.

Although it is known that PCB congeners vary greatly as to their potency in producing biological effects, for purposes of this carcinogenicity assessment Aroclor 1260 is intended to be representative of all PCB mixtures. There is some evidence that mixtures containing more highly chlorinated biphenyls are more potent inducers of hepatocellular carcinoma in rats than mixtures containing less chlorine by weight (reviewed in Kimbrough, 1987 and Schaeffer et al., 1984).

The unit risk should not be used if the water concentration exceeds 50 ug/L, since above this concentration the slope factor may differ from that stated.

___II.B.4. DISCUSSION OF CONFIDENCE (CARCINOGENICITY, ORAL EXPOSURE)

The Norback and Weltman study used an adequate number of animals, observed for their normal lifespan. Only one non-zero test dose was used. A second risk estimate was also calculated based on the numbers of malignant tumors alone, as called for in the EPA's guidelines for carcinogen risk assessment. The slope factor thus derived is 5.7/mg/kg/day, which is 26% less than that derived using combined malignant tumors and neoplastic nodules. This risk estimate is supported by one based on data of Kimbrough et al. (1975).

PCB mixtures in drinking water may not be the same as the mixtures introduced or used for testing carcinogenicity in animals.

___II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

Not available.

___II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

___II.D.1. EPA DOCUMENTATION

U.S. EPA. 1988. Drinking Water Criteria Document for Polychlorinated Biphenyls (PCBs). Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Drinking Water, Washington, DC.

___II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The 1988 Drinking Water Criteria Document for PCBs has received OHEA review.

Agency Work Group Review: 04/22/87

Verification Date: 04/22/87

___II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

Charli Hiremath / ORD -- (202)260-5725/ FTS 260-5725

Debdas Mukerjee / ORD -- (513)569-7572/ FTS 684-7572
9-7572/ FTS 684-7572

----- PROTECTION AND FIRST AID -----

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

FIRST AID SOURCE: CHRIS Manual 1991
SKIN: wash with soap and water.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

----- INITIAL INCIDENT RESPONSE -----

FIRE EXTINGUISHMENT: Water, foam, dry chemical, or carbon dioxide. CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Polychlorinated biphenyls
DOT ID NUMBER: UN2315

* POTENTIAL HAZARDS *

*FIRE OR EXPLOSION

Some of these materials may burn, but none of them ignites readily.

*HEALTH HAZARDS

Contact may cause burns to skin and eyes.

Fire may produce irritating or poisonous gases.

Runoff from fire control or dilution water may cause pollution.

* EMERGENCY ACTION *

Keep unnecessary people away; isolate hazard area and deny entry.

Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection.

CALL CHEMTREC AT 1-800-424-9300 FOR EMERGENCY ASSISTANCE. If water pollution occurs, notify the appropriate authorities.

*FIRE

Small Fires: Dry chemical, CO₂, water spray or regular foam.

Large Fires: Water spray, fog or regular foam.

Move container from fire area if you can do it without risk.

Do not scatter spilled material with high-pressure water streams.

Dike fire-control water for later disposal.

*SPILL OR LEAK

Stop leak if you can do it without risk.

Small Dry Spills: With clean shovel place material into clean, dry container and cover loosely; move containers from spill area.

Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.

Large Spills: Dike far ahead of liquid spill for later disposal.

Cover powder spill with plastic sheet or tarp to minimize spreading.

*FIRST AID

In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water.

Remove and isolate contaminated clothing and shoes at the site.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement. The COMPILERS of the CHEMTOX database shall not be held liable for inaccuracies or omissions within this database, or in any of its printed or displayed output forms.

TOLUENE

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DOT guide: 27
Identification number: UN1294
DOT shipping name: Toluene
Packing group: II
Label(s) required: FLAMMABLE LIQUID
Special provisions: T1
Packaging exceptions: 173.150
Non bulk packaging: 173.202
Bulk packaging: 173.242
Quantity limitations-
Passenger air/rail: 5 L
Cargo aircraft only: 60 L
Vessel stowage: B
Other stowage provisions:

STCC NUMBER: 4909305

CLEAN WATER ACT Sect.307:Yes

CLEAN WATER ACT Sect.311:Yes

National Primary Drinking Water Regulations

Maximum Contaminant Levels (MCL): 1 mg/L (07/30/92)

Maximum Contaminant Level Goals (MCLG): 1 mg/L (07/30/92)

CLEAN AIR ACT: CAA '90 Listed

EPA WASTE NUMBER: U220,D001

CERCLA REF: Not listed

RQ DESIGNATION: C 1000 pounds (454 kg) CERCLA

SARA TPQ VALUE: Not listed

SARA Sect. 312

categories:

Acute toxicity: Irritant

Acute toxicity: adverse effect to target organs.

Chronic toxicity: adverse effect to target organ
after long period of exposure.

Chronic toxicity: mutagen.

Chronic toxicity: reproductive toxin.

Fire hazard: flammable.

LISTED IN SARA Sect 313: Yes

de minimus CONCENTRATION: 1.0 percent

UNITED STATES POSTAL SERVICE MAILABILITY:

Hazard class: Flammable liquid - Mailable as ORM-D

Mailability: Domestic surface mail only

Max per parcel: 1 QT METAL; 1 PT OTHER

NFPA CODES:

HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with
self-contained breathing apparatus.

FLAMMABILITY (RED) : (3) This material can be ignited under almost all
temperature conditions.

REACTIVITY (YELLOW): (0) Stable even under fire conditions.

SPECIAL : Unspecified

----- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON -----

ACGIH TLV list "Threshold Limit Values for 1989-1990"
ATSDR Toxicology Profile available (NTIS** PB/90/198904/AS)
California Assembly Bill 1803 Well Monitoring Chemicals.
California Assembly Bill 2588 Air Toxics "Hot Spots" Chemicals.
California Department of Health Services Drinking Water Action List.
California Proposition 65 Developmental Toxin List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 111 List.
Clean Air Act of November 15, 1990. List of pollutants.
Clean Water Act Section 307 Priority Pollutants
Clean Water Act Section 311 Hazardous Chemicals List.
DOT Hazardous Materials Table. 49 CFR 172.101
EPA Carcinogen Assessment Group List
EPA TSCA 8(a) Preliminary Assessment Information Rule - effective 11/19/82
EPA TSCA 8(d) Health and Safety Data Rule - effective date 10/04/82
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
New Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992
Pennsylvania Hazardous Substance List
RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264
RCRA Hazardous Waste
SARA Section 313 Toxic Chemicals List
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
TOLUENE [108-88-3]
Washington State Discarded Chemical Products List, November 17, 1989
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

----- TOXICITY DATA -----

SHORT TERM TOXICITY: INHALATION: 100 ppm exposure can cause dizziness, drowsiness and hallucinations. 100-200 ppm can cause depression. 200-500 ppm can cause headaches, nausea, loss of appetite, loss of energy, loss of coordination and coma. in addition to the above, death has resulted from exposure to 10,000 ppm for an unknown time. SKIN: can cause dryness and irritation. absorption may cause or increase the severity of symptoms listed above. Eyes: can cause irritation at 300 ppm. INGESTION: can cause a burning sensation in the mouth and stomach, upper abdominal pain, cough, hoarseness, headache, nausea, loss of appetite, loss of energy, loss of coordination and coma.(NYDH)

LONG TERM TOXICITY: levels below 200 ppm may produce headache, tiredness and nausea. from 200 to 750 ppm symptoms may include insomnia, irritability, dizziness, some loss of memory, loss of appetite, a feeling of drunkenness and disturbed menstruation. levels up to 1,500 ppm may cause heart palpitations and loss of coordination. blood effects and anemia have been reported but are probably due to contamination by benzene. most of these effects area believed to go away when exposure stops.(NYDH)

TARGET ORGANS: CNS, liver, kidneys, skin, eyes

SYMPTOMS: Vapors irritate eyes and upper respiratory tract; cause dizziness, headache, anesthesia, respiratory arrest. Liquid irritates eyes and causes drying of skin. If aspirated, causes coughing, gagging, distress, and rapidly developing pulmonary edema. If ingested causes vomiting, griping, diarrhea, depressed respiration. Source: CHRIS

CONC IDLH: 2000ppm

NIOSH REL: 100 ppm Time weighted averages for 8-hour exposure
375 mg/M3 Time weighted averages for 8-hour exposure
200 ppm Ceiling exposures which shall at no time be exceeded(10-MIN)
750 mg/M3 Ceiling exposures which shall at no time be exceeded(10-MIN)

ACGIH TLV: TLV = 50ppm(188 mg/M3) Skin
ACGIH STEL: Not listed

OSHA PEL: Transitional Limits:
PEL = 200 PPM; CEILING = 300 PPM; MAXIMUM PEAK ABOVE CEILING
Final Rule Limits:
TWA = 100 ppm (375 mg/M3)
STEL = 150 ppm(560 mg/M3)

MAK INFORMATION: 100 ppm
380 mG/M3
Substance with systemic effects, onset of effect less than or equal to 2 hrs: Peak = 5xMAK for 30 minutes, 2 times per shift of 8 hours.
Risk of damage to the developing embryo or fetus must be considered probable. Damage cannot be excluded even when the MAK values are adhered to.

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS: IARC: Not listed

MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)

* orl-hmn LDLo:50 mg/kg YAKUD5 22,883,80

ihl-hmn TCLo:200 ppm JMAAP 123,1106,43

BRAIN AND COVERINGS

Recordings from specific areas of CNS

BEHAVIORAL

Antipsychotic

BLOOD

Changes in bone marrow not included above

LD50 value: orl-rat LD50:636 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:636 mg/kg

ihl-rat LC50:>26700 ppm/1H

ipr-rat LD50:1332 mg/kg

ivn-rat LD50:1960 mg/kg

unr-rat LD50:6900 mg/kg

ihl-mus LC50:400 ppm/24H

ipr-mus LD50:59 mg/kg

scu-mus LD50:2250 mg/kg

unr-mus LD50:2000 mg/kg

ihl-rbt LCLo:55000 ppm/40M

skn-rbt LD50:12124 mg/kg

ivn-rbt LDLo:130 mg/kg

ihl-gpg LCLo:1600 ppm

ipr-gpg LD50:500 mg/kg

scu-frg LDLo:920 mg/kg

ipr-mam LDLo:1750 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):

This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

ihl-rat TCLo:1500 mg/m3/24H (1-8D preg) TXCYAC 11,55,78

EFFECTS ON EMBRYO OR FETUS

Fetotoxicity(except death,e.g.,stunted fetus)

SPECIFIC DEVELOPMENTAL ABNORMALITIES

Musculoskeletal system

ihl-rat TCLo:1000 mg/m3/24H (7-14D preg) FMORAO
28,286,80

SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rat TCLO:100 ppm (51W male) SAIGBL 13,501,71
PATERNAL EFFECTS
Testes,epididymis,sperm duct

orl-mus TDLo:9 gm/kg (6-15D preg) TJADAB 19,41A,79
EFFECTS ON EMBRYO OR FETUS
Fetal death

orl-mus TDLo:15 gm/kg (6-15D preg) TJADAB 19,41A,79
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

orl-mus TDLo:30 gm/kg (6-15D preg) TJADAB 19,41A,79
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Craniofacial(including nose and tongue)

ihl-mus TCLO:500 mg/m3/24H (6-13D preg) TXCYAC 11,55,78
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

ihl-mus TCLO:1000 ppm/6H (2-17D preg) TJEMDR 7,265,82
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-mus TCLO:400 ppm/7H (7-16D preg) FAATDF 6,145,86
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system
EFFECTS ON NEWBORN

ihl-mus TCLO:200 ppm/7H (7-16D preg) FAATDF 6,145,86
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Urogenital system

----- EPA's IRIS DATA SUMMARY -----
Toluene; CASRN 108-88-3 (04/01/92)

_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Toluene
CASRN -- 108-88-3
Last Revised -- 08/01/90

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a

low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- D; not classified

Basis -- No human data and inadequate animal data. Toluene did not produce positive results in the majority of genotoxic assays.

II.A.2. HUMAN CARCINOGENICITY DATA

None.

II.A.3. ANIMAL CARCINOGENICITY DATA

A chronic (106-week) bioassay of toluene in F344 rats of both sexes reported no carcinogenic responses (CIIT, 1980). A total of 960 rats were exposed by inhalation for 6 hours/day, 5 days/week to toluene at 0, 30, 100, or 300 ppm. Groups of 20/sex/dose were sacrificed at 18 months. Gross and microscopic examination of tissues and organs identified no increase in neoplastic tissue or tumor masses among treated rats when compared with controls. The study is considered inadequate because the highest dose administered was well below the MTD for toluene and because of the high incidence of lesions and pathological changes in the control animals.

Several studies have examined the carcinogenicity of toluene following repeated dermal applications. Toluene (dose not reported) applied to shaved interscapular skin of 54 male mice (strains A/He, C3HeB, SWR) throughout their lifetime (3 times weekly) produced no carcinogenic response (Poel, 1963). One drop of toluene (about 6 mL) applied to the dorsal skin of 20 random-bred albino mice twice weekly for 50 weeks caused no skin papillomas or carcinomas after a 1-year latency period was allowed (Coombs et al., 1973). No increase in the incidence of skin or systemic tumors was demonstrated in male or female mice of three strains (CF, C3H, or CBaH) when toluene was applied to the back of 25 mice of each sex of each strain at 0.05-0.1 mL/mouse, twice weekly for 56 weeks (Doak et al., 1976). One skin papilloma and a single skin carcinoma were reported among a group of 30 mice treated dermally with one drop of 0.2% (w/v) solution toluene twice weekly, administered from droppers delivering 16-

20 uL per drop for 72 weeks (Lijinsky and Garcia, 1972). It is not reported whether evaporation of toluene from the skin was prevented during these studies.

II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

Toluene was found to be nonmutagenic in reverse mutation assays with *S. typhimurium* (Mortelmans and Riccio, 1980; Nestmann et al., 1980; Bos et al., 1981; Litton Bionetics, Inc., 1981; Snow et al., 1981) and *E. coli* (Mortelmans and Riccio, 1980), with and without metabolic activation. Toluene did not induce mitotic gene conversion (Litton Bionetics, Inc., 1981; Mortelmans and Riccio, 1980) or mitotic crossing over (Mortelmans and Riccio, 1980) in *S. cerevisiae*. Although Litton Bionetics, Inc. (1981) reported that toluene did not cause increased chromosomal aberrations in bone marrow cells, several Russian studies (Dobrokhotov, 1972; Lyapkalo, 1973) report toluene as effective in causing chromosomal damage in bone marrow cells of rats. There was no evidence of chromosomal aberrations in blood lymphocytes of workers exposed to toluene only (Maki-Paakkanen et al., 1980; Forni et al., 1971), although a slight increase was noted in workers exposed to toluene and benzene (Forni et al., 1971; Funes-Craviota et al., 1977). This finding is supported by studies of cultured human lymphocytes exposed to toluene in vitro; no elevation of chromosomal aberrations or sister chromatid exchanges was observed (Gerner-Smidt and Friedrich, 1978).

II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

Not available.

II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

Not available.

II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

II.D.1. EPA DOCUMENTATION

U.S. EPA. 1987. Drinking Water Criteria Document for Toluene. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Drinking Water, Washington, DC. ECAO-CIN-408.

___II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The values in the 1987 Drinking Water Criteria Document for Toluene have received peer and administrative review.

Agency Work Group Review: 09/15/87

Verification Date: 09/15/87

___II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

Dharm V. Singh / ORD -- (202)260-5958 / FTS 260-5958

Robert E. McGaughy / ORD -- (202)260-5898 / FTS 260-5898

----- PROTECTION AND FIRST AID -----

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Promptly when skin becomes wet.

** REMOVE CLOTHING:
Immediately remove any clothing that becomes wet to avoid any flammability

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (TOLUENE)

1000 ppm: Any chemical cartridge respirator with organic vapor
cartridge(s). * Substance reported to cause eye irritation or damage may
require eye protection. / Any supplied-air respirator. * Substance

reported to cause eye irritation or damage may require eye protection. / Any powered air-purifying respirator with organic vapor cartridge(s). * Substance reported to cause eye irritation or damage may require eye protection. / Any self-contained breathing apparatus. * Substance reported to cause eye irritation or damage may require eye protection. 2000 ppm: Any supplied-air respirator operated in a continuous flow mode. * Substance reported to cause eye irritation or damage may require eye protection. / Any self-contained breathing apparatus with a full facepiece. / Any supplied-air respirator with a full facepiece. / Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister.

EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.: Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.

ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: NIOSH
EYE: irr immed
SKIN: soap wash promptly
INHALATION: art resp
INGESTION: no vomit

FIRST AID SOURCE: CHRIS Manual 1991
INHALATION: remove to fresh air, give artificial respiration and oxygen if needed; call a doctor.
INGESTION: do NOT induce vomiting; call a doctor.
EYES: flush with water for at least 15 min.
SKIN: wipe off, wash with soap and water.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

----- INITIAL INCIDENT RESPONSE -----

FIRE EXTINGUISHMENT: Carbon dioxide or dry chemical for small fires, ordinary foam for large fires. Note: Water may be ineffective CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Toluène
DOT ID NUMBER: UN1294

* POTENTIAL HAZARDS *

*FIRE OR EXPLOSION

Flammable/combustible material; may be ignited by heat, sparks or flames.

Vapors may travel to a source of ignition and flash back.

Container may explode in heat of fire.

Vapor explosion hazard indoors, outdoors or in sewers.

Runoff to sewer may create fire or explosion hazard.

*HEALTH HAZARDS

May be poisonous if inhaled or absorbed through skin.

Vapors may cause dizziness or suffocation.

Contact may irritate or burn skin and eyes.

Fire may produce irritating or poisonous gases.

Runoff from fire control or dilution water may cause pollution.

* EMERGENCY ACTION *

Keep unnecessary people away; isolate hazard area and deny entry.

Stay upwind; keep out of low areas.

Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection.

Isolate for 1/2 mile in all direction if tank, rail car or tank truck is involved in fire.

CALL CHEMTREC AT 1-800-424-9300 FOR EMERGENCY ASSISTANCE. If water pollution occurs, notify the appropriate authorities.

*FIRE

Small Fires: Dry chemical, CO₂, water spray or regular foam.

Large Fires: Water spray, fog or regular foam.

Move container from fire area if you can do it without risk.

Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks.

For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

Withdraw immediately in case of rising sound of venting safety device or any discoloration of tank due to fire.

*SPILL OR LEAK

Shut off ignition sources; no flares, smoking or flames in hazard area.

Stop leak if you can do it without risk.

Water spray may reduce vapor; but it may not prevent ignition in closed spaces.

Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.

Large Spills: Dike far ahead of liquid spill for later disposal.

*FIRST AID

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen.

In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water.

Remove and isolate contaminated clothing and shoes at the site.

TRICHLOROETHANE
(METHYL CHLOROFORM)

CHEMTOX DATA

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----- IDENTIFIERS -----

CHEMTOX RECORD 1642

LAST UPDATE OF THIS RECORD: 06/03/93

NAME: METHYL CHLOROFORM

SYNONYMS: AEROTHENE TT; CHLOROETENE; CHLOROETHENE; CHLOROETHENE NU;
CHLOROFORM, METHYL-; CHLOROTHANE NU; CHLOROTHENE;
CHLOROTHENE(Inhibited); CHLOROTHENE NU; CHLOROTHENE VG;
CHLORTEN; INHIBISOL; METHYLCHLOROFORM; METHYL CHLOROFORM
(DOT); METHYLTRICHLOROMETHANE; NCI-C04626; SOLVENT 111;
alpha-T; 1,1,1-TRICHLOROETHANE (Dutch);
1,1,1-TRICHLOROETHANE (German); TRICHLORO-1,1,1-ETHANE
(French); alpha-TRICHLOROETHANE; 1,1,1-TRICHLOROETHANE;
1,1,1-TRICHLOROETHANE (Italian); ETHANE, 1,1,1-TRICHLORO-;
1,1,1-TRICHLOROETHANE, STABILIZED

CAS: 71-55-6

RTECS: KJ2975000

FORMULA: C2H3Cl3

MOL WT: 133.40

WLN: GXGG1

CHEMICAL CLASS: Halogenated h-carbon

See other identifiers listed below under Regulations.

----- PROPERTIES -----

PHYSICAL DESCRIPTION: colorless liquid with a mild, chloroform-like odor

BOILING POINT: 346.31 K 73.1 C 163.6 F

MELTING POINT: 235.76 K -37.4 C -35.4 F

FLASH POINT: NA

AUTO IGNITION: 809.81 K 536.6 C 1489.6 F

VAPOR PRESSURE: 100 mm @ 20.0

UEL: 16 %

LEL: 7 %

VAPOR DENSITY: 4.63 (air=1)

EVAPORATION RATE: 6.00 (n-BUTYL ACETATE=1)

SPECIFIC GRAVITY: 1.3492 @ 20

DENSITY: 1.3376 g/mL @ 20 C

WATER SOLUBILITY: 0.07 %

INCOMPATIBILITIES: strong caustics, strong oxidizers,
chemically active metals, such as
aluminum, magnesium powders, sodium,
potassium

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: READILY CORRODES ALUMINUM AND ALUMINUM
ALLOYS. Source: THIC

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: HIGHLY TOXIC, ARE IRRITATING FUMES

ODOR DETECTED AT (ppm): 100 ppm
ODOR DESCRIPTION: Chloroform-like; sweetish Source:CHRIS
100 % ODOR DETECTION: No data

----- REGULATIONS -----

DOT hazard class: 6.1 POISON
DOT guide: 74
Identification number: UN2831
DOT shipping name: 1,1,1-Trichloroethane
Packing group: III
Label(s) required: KEEP AWAY FROM FOOD
Special provisions: N36,T7
Packaging exceptions: 173.153
Non bulk packaging: 173.203
Bulk packaging: 173.241
Quantity limitations-
Passenger air/rail: 60 L
Cargo aircraft only: 220 L
Vessel stowage: A
Other stowage provisions:40,M2

STCC NUMBER: Not listed

CLEAN WATER ACT Sect.307:Yes

CLEAN WATER ACT Sect.311:No

National Primary Drinking Water Regulations

Maximum Contaminant Levels (MCL): 0.2 mg/L (01/09/89)

Maximum Contaminant Level Goals (MCLG): 0.2 mg/L (01/09/89)

CLEAN AIR ACT: CAA '90 Listed

EPA WASTE NUMBER: U226

CERCLA REF: Not listed

RQ DESIGNATION: C 1000 pounds (454 kg) CERCLA

SARA TPQ VALUE: Not listed

SARA Sect. 312

categories:

Acute toxicity: Irritant

Acute toxicity: adverse effect to target organs.

Chronic toxicity: adverse effect to target organ
after long period of exposure.

Chronic toxicity: mutagen.

Chronic toxicity: reproductive toxin.

LISTED IN SARA Sect 313: Yes

de minimus CONCENTRATION: 1.0 percent

UNITED STATES POSTAL SERVICE MAILABILITY:

Hazard class: ORM-A

Mailability: Domestic service and air transportation; shipper's declaration

Max per parcel: 10 GAL; 1 PT

NFPA CODES:

HEALTH HAZARD (BLUE): (3) Extremely hazardous to health. Full protection

required. No skin surface should be exposed.

FLAMMABILITY (RED) : (1) This material must be preheated before ignition can occur.

REACTIVITY (YELLOW): (1) Normally stable, but may become unstable at elevated temperature and pressures.

SPECIAL : Unspecified

----- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON -----

ACGIH TLV list "Threshold Limit Values for 1989-1990"
California Assembly Bill 1803 Well Monitoring Chemicals.
California Assembly Bill 2588 Air Toxics "Hot Spots" Chemicals.
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 111 List.
Clean Air Act of November 15, 1990. List of pollutants.
Clean Water Act Section 307 Priority Pollutants
DOT Hazardous Materials Table. 49 CFR 172.101
DOT Marine Pollutant. Proposed list. 57 FR 3854, Jan 31, 1992
EPA Carcinogen Assessment Group List
EPA TSCA 8(a) Preliminary Assessment Information Rule - effective 11/19/82
EPA TSCA 8(d) Health and Safety Data Rule - effective date 10/04/82
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Section 12(b) Export Rule Notification.
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
First Third Wastes List. 40 CFR 268.10. 54 FR 26594 (June 23, 1989)
METHYL CHLOROFORM [71-55-6]
Massachusetts Substance List.
New Jersey DEQ100 list for release reporting.
New Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
Pennsylvania Hazardous Substance List
RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264
RCRA Hazardous Waste
SARA Section 313 Toxic Chemicals List
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
Washington State Discarded Chemical Products List, November 17, 1989

----- TOXICITY DATA -----

SHORT TERM TOXICITY: INHALATION: levels above 900 ppm can cause dizziness, mental confusion, drowsiness, loss of coordination and unconsciousness. death may result. SKIN: can cause irritation and rash. absorption is moderate; may contribute significantly to health hazard. Eyes: has caused irritation at levels of 450 ppm. INGESTION: may cause symptoms similar to inhalation. in addition, may cause mouth, throat and stomach irritation.(NYDH)

LONG TERM TOXICITY: repeated or prolonged contact at levels of 450 ppm or above may result in irritation and dry, scaly, fractured skin . dizziness, mental confusion, slowed response time and generally reversible liver and kidney damage may result from prolonged inhalation.(NYDH)

TARGET ORGANS: skin,cvs,CNS,eyes

SYMPTOMS: INHALATION: symptoms range from loss of equilibrium and incoordination to loss of consciousness; high concentration can be fatal due to simple asphyxiation combined with loss of consciousness. INGESTION: produces effects similar to inhalation and may cause some feeling of nausea. EYES: slightly irritating and lachrymatory. SKIN: defatting action may cause dermatitis. Source: CHRIS

CONC IDLH: 1000PPM

NIOSH REL: 350 ppm Ceiling exposures which shall at no time be exceeded 1900 mg/M3 Ceiling exposures which shall at no time be exceeded

ACGIH TLV: TLV = 350ppm(1,900 mg/M3)
ACGIH STEL: STEL = 450 ppm(2,450 mg/M3)

OSHA PEL: Transitional Limits:
PEL = 350 ppm(1900mg/M3)
Final Rule Limits:
TWA = 350 ppm (1900 mg/M3)
STEL = 450 ppm(2450 mg/M3)

MAK INFORMATION: 200 ppm
1080 mg/M3
Substance with systemic effects, onset of effect less than or equal to 2 hrs: Peak = 5xMAK for 30 minutes, 2 times per shift of 8 hours.
There is no reason to fear a risk of damage to the developing embryo or fetus when MAK values are adhered to.

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS: IARC: Not classified as to human carcinogenicity or probably not carcinogenic to humans.
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed

OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)

ihl-man LCLo:27 gm/m3/10M JOCMA7 8,358,66

ihl-man TCLo:350 ppm WEHRBJ 10,82,73

BEHAVIORAL

Hallucinations, distorted perceptions

BEHAVIORAL

Changes in motor activity(specific assay)

BEHAVIORAL

Change in psychophysiological tests

orl-hmn TDLo:670 mg/kg NTIS** PB257-185

GASTROINTESTINAL

Hypermotility,diarrhea

GASTROINTESTINAL

Nausea or vomiting

GASTROINTESTINAL

Other changes

ihl-hmn TCLo:920 ppm/70M AIHAAP 19,353,58

BEHAVIORAL

Changes in motor activity(specific assay)

SENSE ORGANS

Eye

Conjunctive irritation

LD50 value: orl-rat LD50:10300 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:10300 mg/kg

ihl-rat LC50:18000 ppm/4H

ipr-rat LD50:3593 mg/kg

orl-mus LD50:11240 mg/kg

ihl-mus LC50:3911 ppm/2H

ipr-mus LD50:3636 mg/kg

scu-mus LD50:16 gm/kg

orl-dog LD50:750 mg/kg

ipr-dog LD50:3100 mg/kg

ivn-dog LDLo:95 mg/kg

ihl-cat LC50:24400 mg/m3

orl-rbt LD50:5660 mg/kg

skn-rbt LD50:>5 gm/kg

scu-rbt LDLo:500 mg/kg

orl-gpg LD50:9470 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

eye-man 450 ppm/8H

skn-rbt 5 gm/12D-I MLD

skn-rbt 500 mg/24H MOD

eye-rbt 100 mg MLD
eye-rbt 2 mg/24H SEV

Reproductive toxicity (1992 RTECS):

This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

orl-rat TDLo:43 mg/kg (1-22D preg/21D post) TJADAB
29(2),25A,84

SPECIFIC DEVELOPMENTAL ABNORMALITIES

Cardiovascular(circulatory)system

----- EPA's IRIS DATA SUMMARY -----

1,1,1-Trichloroethane; CASRN 71-55-6 (04/01/92)

II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- 1,1,1-Trichloroethane

CASRN -- 71-55-6

Last Revised -- 09/01/90

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- D; not classifiable as to human carcinogenicity.

Basis -- There are no reported human data and animal studies (one lifetime gavage, one intermediate-term inhalation) have not demonstrated carcinogenicity. Technical grade 1,1,1-trichloroethane has been shown to be weakly mutagenic, although the contaminant, 1,4-dioxane, a known animal carcinogen, may be responsible for this response.

II.A.2. HUMAN CARCINOGENICITY DATA

None.

II.A.3. ANIMAL CARCINOGENICITY DATA

Inadequate. The NCI (1977) treated Osborne-Mendel rats (50/sex/dose) with 750 or 1500 mg/kg technical-grade 1,1,1-trichloroethane 5 times/week for 78 weeks by gavage. The rats were observed for an additional 32 weeks. Twenty rats of each sex served as untreated controls. Low survival of both male and female treated rats (3%) may have precluded detection of a significant number of tumors late in life. Although a variety of neoplasms was observed in both treated and matched control rats, they were common to aged rats and were not dose-related. Similar results were obtained when the NCI (1977) treated B6C3F1 hybrid mice with the time-weighted average doses of 2807 or 5615 mg/kg 1,1,1-trichloroethane by gavage 5 days/week for 78 weeks. The mice were observed for an additional 12 weeks. The control and treated groups had 20 and 50 animals of each sex, respectively. Only 25 to 45% of those treated survived until the time of terminal sacrifice. A variety of neoplasms were observed in treated groups, but the incidence not statistically different from matched controls.

Quast et al. (1978) exposed 96 Sprague-Dawley rats of both sexes to 875 or 1750 ppm 1,1,1-trichloroethane vapor for 6 hours/day, 5 days/week for 12 months, followed by an additional 19-month observation period. The only significant sign of toxicity was an increased incidence of focal hepatocellular alterations in female rats at the highest dosage. It was not evident that a maximum tolerated dose (MTD) was used nor was a range-finding study conducted. No significant dose-related neoplasms were reported, but these dose levels were below those used in the NCI study.

II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

Mutagenicity testing of 1,1,1-trichloroethane has produced positive results in *S. typhimurium* strain TA100 (Simmon et al., 1977; Fishbein, 1979; Snow et al., 1979) as well as some negative results (Henschler et al., 1977; Taylor, 1978).

It was mutagenic for *S. typhimurium* strain TA1535 both with exogenous metabolic activation (Farber, 1977) and without activation (Nestmann et al., 1980). 1,1,1-Trichloroethane did not result in gene conversion or mitotic recombination in *Saccharomyces cerevisiae* (Farber, 1977; Simmon et al., 1977) nor was it positive in a host-mediated forward mutation assay using *Schizosaccharomyces pombe* in mice. The chemical also failed to produce chromosomal aberrations in the bone marrow of cats (Rampy et al., 1977), but responded positively in a cell transformation test with rat embryo cells (Price et al., 1978).

An isomer, 1,1,2-trichloroethane, is carcinogenic in mice, inducing liver cancer and pheochromocytomas in both sexes. Dichloroethanes,

tetrachloroethanes and hexachloroethanes also produced liver cancer in mice and other types of neoplasms in rats.

It should be noted that 1,4-dioxane, a known animal carcinogen that causes liver and nasal tumors in more than one strain of rats and hepatocellular carcinomas in mice, is a contaminant of technical-grade 1,1,1-trichloroethane.

__II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

Not available.

__II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

Not available.

__II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

__II.D.1. EPA DOCUMENTATION

U.S. EPA. 1984a. Health Effects Assessment for 1,1,1-Trichloroethane. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Emergency and Remedial Response, Washington, DC.

U.S. EPA. 1984b. Health Assessment Document for 1,1,1-Trichloroethane. Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Research Triangle Park, NC. EPA-600/8-82-003F.

__II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The 1984 Health Effects Assessment for 1,1,1-Trichloroethane has received limited Agency review. The values in the 1984 Health Assessment Document for 1,1,1-Trichloroethane have received both Agency and public review.

Agency Work Group Review: 08/05/87

Verification Date: 08/05/87

II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

Charlingayya Hiremath / ORD -- (202)260-5898 / FTS 260-5898

----- PROTECTION AND FIRST AID -----

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

- ** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.
- ** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.
- ** EXPOSED PERSONNEL SHOULD WASH:
Promptly when skin becomes contaminated.
- ** REMOVE CLOTHING:
Promptly remove non-impervious clothing that becomes wet.
- ** REFERENCE: NIOSH

FIRST AID SOURCE: NIOSH
EYE: irr immed
SKIN: soap wash promptly
INHALATION: art resp
INGESTION: ipecac, vomit

FIRST AID SOURCE: CHRIS Manual 1991
Get medical attention for all eye exposures and any other serious over-exposures. Do NOT administer adrenalin or epinephrine; otherwise, treatment is symptomatic.
INHALATION: remove victim to fresh air; if necessary, apply artificial respiration and/or administer oxygen.
INGESTION: have victim drink water and induce vomiting.
EYES: flush thoroughly with water.
SKIN: remove contaminated clothing and wash exposed area thoroughly with soap and warm water.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not

breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site. Use first aid treatment according to the nature of the injury.

----- INITIAL INCIDENT RESPONSE -----

FIRE EXTINGUISHMENT: Dry chemical, foam, or carbon dioxide. CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).

DOT SHIPPING NAME: 1,1,1-Trichloroethane

DOT ID NUMBER: UN2831

ERG90

GUIDE 74

* POTENTIAL HAZARDS *

*HEALTH HAZARDS

Vapors may cause dizziness or suffocation.
Exposure in an enclosed area may be very harmful.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

*FIRE OR EXPLOSION

Some of these materials may burn, but none of them ignites readily.
Most vapors heavier than air.
Air/vapor mixtures may explode when ignited.
Container may explode in heat of fire.

* EMERGENCY ACTION *

Keep unnecessary people away; isolate hazard area and deny entry.
Stay upwind, out of low areas, and ventilate closed spaces before entering.
Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection.
Isolate 1/2 mile in all directions if tank, rail car or tank truck is involved in fire.
Remove and isolate contaminated clothing at the site.
CALL CHEMTREC AT 1-800-424-9300 FOR EMERGENCY ASSISTANCE.
If water pollution occurs, notify the appropriate authorities.

*FIRE

Small Fires: Dry chemical or CO2.
Large Fires: Water spray, fog or regular foam.
Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks.

*SPILL OR LEAK

Shut off ignition sources; no flares, smoking or flames in hazard area.
Stop leak if you can do it without risk.
Small Liquid Spills: Take up with sand, earth or other noncombustible absorbent material.
Large Spills: Dike far ahead of liquid spill for later disposal.

***FIRST AID**

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen.

In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water.

Remove and isolate contaminated clothing and shoes at the site.

Use first aid treatment according to the nature of the injury.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.

The COMPILERS of the CHEMTOX database shall not be held liable for inaccuracies or omissions within this database, or in any of its printed or displayed output forms.

VINYL CHLORIDE

CHEMTOX DATA

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----- IDENTIFIERS -----

CHEMTOX RECORD 419

LAST UPDATE OF THIS RECORD: 06/03/93

NAME: VINYL CHLORIDE
SYNONYMS: CHLOROETHYLENE; VINYL CHLOROIDE; CHLOROETHEN;
CHLOROETHYLENE; CHLORURE DE VINYLE (FRENCH); CHLORO DI
VINYLE (ITALIAN); ETHYLENE MONOCHLORIDE; MONOCHLOROETHENE;
MONOCHLOROETHYLENE (DOT); VINYL CHLORIDE MONOMER; VINYL C
MONOMER; WINYLU CHLORED (POLISH); VCM; VCL
CAS: 75-01-4 RTECS: KU9625000
FORMULA: C2H3Cl MOL WT: 62.50
WLN: GlU1
CHEMICAL CLASS: Vinyl halide

See other identifiers listed below under Regulations.

----- PROPERTIES -----

PHYSICAL DESCRIPTION: colorless liquified compressed sag with a sweet odor

BOILING POINT:	259.4 K	-13.8 C	7.2 F
MELTING POINT:	119.4 K	-153.8 C	-244.8 F
FLASH POINT:	194 K	-79.15 C	-110.5 F
AUTO IGNITION:	745 K	471.8 C	1373 F
CRITICAL TEMP:	431.6 K	158.45 C	317.21 F
CRITICAL PRESS:	5.34 kN/M2	52.6 atm	773 psia
HEAT OF VAP:	160 Btu/lb	88.85 cal/g	3.718x E5 J/kg
HEAT OF COMB:	-8136 Btu/lb	-4523 cal/g	-189x E5 J/kg
VAPOR PRESSURE:	2600 mm @ 25		
UEL:	33 %		
LEL:	3.6 %		
IONIZATION POTENTIAL (eV):	7.57		
VAPOR DENSITY:	2.2 (air=1) (air=1)		
SPECIFIC GRAVITY:	0.969 @ -13C		
DENSITY:	0.969 g/cc or 9.0117 lb/gal		
WATER SOLUBILITY:	insol		
INCOMPATIBILITIES:			

REACTIVITY WITH WATER: No data on water reactivity
REACTIVITY WITH COMMON MATERIALS: No data
STABILITY DURING TRANSPORT: No Data
NEUTRALIZING AGENTS: No data
POLYMERIZATION POSSIBILITIES: POLYMERIZES IN PRESENCE OF AIR,
SUNLIGHT, OR HEAT UNLESS STABILIZED BY
INHIBITORS.

TOXIC FIRE GASES: HCl and unburned toxic vapors
ODOR DETECTED AT (ppm): 260 ppm
ODOR DESCRIPTION: Pleasant, sweet Source: CHRIS
100 % ODOR DETECTION: No data

----- REGULATIONS -----

DOT hazard class: 2.1 FLAMMABLE GAS
DOT guide: 17
Identification number: UN1086
DOT shipping name: Vinyl chloride, inhibited
Packing group:
Label(s) required: FLAMMABLE GAS
Special provisions: B44
Packaging exceptions: 173.306
Non bulk packaging: 173.304
Bulk packaging: 173.314, 315
Quantity limitations-
Passenger air/rail: Forbidden
Cargo aircraft only: 150 kg
Vessel stowage: B
Other stowage provisions: 40

STCC NUMBER: 4905792

CLEAN WATER ACT Sect.307: Yes

CLEAN WATER ACT Sect.311: No

National Primary Drinking Water Regulations

Maximum Contaminant Levels (MCL): 0.002 mg/L (01/09/89)

Maximum Contaminant Level Goals (MCLG): 0 mg/L (01/09/89)

CLEAN AIR ACT: CAA '90 Listed

EPA WASTE NUMBER: U043, D043, D001

CERCLA REF: Not listed

RQ DESIGNATION: X 1 pound (0.454 kg) CERCLA

SARA TPQ VALUE: Not listed

SARA Sect. 312

categories:

Acute toxicity: adverse effect to target organs.

Chronic toxicity: carcinogen

Chronic toxicity: adverse effect to target organ
after long period of exposure.

Chronic toxicity: mutagen.

Chronic toxicity: reproductive toxin.

Fire hazard: flammable.

Sudden pressure: compressed gases.

Reactive hazard: unstable/reactive.

Acute toxicity: Toxic. LD50 > 50 and <= 500
mg/kg (oral rat).

LISTED IN SARA Sect 313: Yes

de minimus CONCENTRATION: 0.1 percent

UNITED STATES POSTAL SERVICE MAILABILITY:

Hazard class: Not given

Mailability: Nonmailable

Max per parcel: 0

NFPA CODES:

HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with self-contained breathing apparatus.
FLAMMABILITY (RED) : (4) This material forms readily ignitable mixtures in air.
REACTIVITY (YELLOW): (1) Normally stable, but may become unstable at elevated temperature and pressures.
SPECIAL : Unspecified

----- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON -----

ACGIH TLV list "Threshold Limit Values for 1989-1990"
ATSDR Toxicology Profile available (NTIS** PB/90/103870/AS)
California OSHA Carcinogens List.
California Assembly Bill 1803 Well Monitoring Chemicals.
California Assembly Bill 2588 Air Toxics "Hot Spots" Chemicals.
California Assembly Bill 1807 Toxic Air Contaminants.
California Proposition 65 Carcinogen List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 111 List.
Clean Air Act Section 112 Hazardous Air Pollutants List.
Clean Air Act of November 15, 1990. List of pollutants.
Clean Water Act Section 307 Priority Pollutants
DOT Hazardous Materials Table. 49 CFR 172.101
EPA Carcinogen Assessment Group List
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
Known carcinogen (ACGIH). "Threshold Limit Values for 1989-1990"
Massachusetts Substance List.
National Toxicology Program (NTP) list of human carcinogens
New Jersey DEQ100 list for release reporting.
New Jersey Right To Know Substance List. (December 1987)
New Jersey Right to Know Substance List. Listed as a carcinogen.
New Jersey Right to Know Substance List. Listed as a mutagen.
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992
Pennsylvania Hazardous Substance List
RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264
RCRA Hazardous Waste
RCRA Toxicity Characteristics (TC) list dated March 29, 1990
SARA Section 313 Toxic Chemicals List
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
VINYL CHLORIDE [75-01-4]
Washington State Discarded Chemical Products List, November 17, 1989
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

----- TOXICITY DATA -----

SHORT TERM TOXICITY: INHALATION: exposure at 8,000 ppm for 5 minutes can cause a feeling of intoxication, tiredness, drowsiness, abdominal pain, numbness and tingling in fingers and toes, pains in joints, coughing, sneezing, irritability and loss of appetite and weight. SKIN: contact with liquid may cause frostbite; contact with vapor may cause irritation and rash. absorption is possible through the skin. Eyes: can cause severe and immediate irritation. INGESTION: none found.(NYDH)

LONG TERM TOXICITY: may cause club-like swelling and shortening of finger tips. skin may become thickened and stiff with coarse, whitish patches. bones and joints of arms and legs may suffer damage. liver and spleen damage may occur. not all symptoms disappear after exposure stops. vinyl chloride has caused liver cancer in occupationally exposed individuals.(NYDH)

TARGET ORGANS: skin, eyes, mucous membranes, nervous system, liver, kidneys.

SYMPTOMS: INHALATION: high concentrations cause dizziness, anesthesia, lung irritation. SKIN: may cause frostbite; phenol inhibitor may be absorbed through skin if large amounts of liquid evaporate. Source: CHRIS

CONC IDLH: Unknown

NIOSH REL: Potential occupational carcinogen (use 1910.1017)

ACGIH TLV: TLV = 5ppm Confirmed human carcinogen (A1)
ACGIH STEL: Not listed

OSHA PEL: Final Rule Limits:
TWA = 1 ppm
CEILING = 5 ppm
CONSULT 29CFR 1910.1017

MAK INFORMATION: Carcinogenic working material without MAK
Capable of inducing malignant tumors as shown by experience with humans.

CARCINOGEN?: Y STATUS: See below

REFERENCES: HUMAN POSITIVE IARC** 19,377,79
ANIMAL POSITIVE IARC** 7,291,74
HUMAN SUSPECTED IARC** 7,291,74
ANIMAL POSITIVE IARC** 19,377,79
HUMAN POSITIVE IARC** 28,151,82

CARCINOGEN LISTS: IARC: Carcinogen as defined by

IARC as carcinogenic to humans,
with sufficient epidemiological
evidence.

MAK: Capable of inducing malignant
tumors as shown by experience in
humans.

NIOSH: Carcinogen defined by NIOSH
with no further categorization.

NTP: Carcinogen defined by NTP as
known to be carcinogenic, with
evidence from human studies.

ACGIH: Carcinogen defined by ACGIH
TLV Committee as a confirmed human
carcinogen, recognized to have
carcinogenic or cocarcinogenic
potential.

OSHA: Cancer suspect

LD50 value: orl-rat LD50:500 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:500 mg/kg
ihl-rat LC50:18 pph/15M
ihl-mam LCLo:200 ppm/18M

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):

This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

ihl-man TCLo:30 mg/m3 (5Y male) GTPZAB 24(5),28,80
PATERNAL EFFECTS
Spermatogenesis

ihl-rat TCLo:100 ppm/6H (26W male) EESADV 10,281,85
PATERNAL EFFECTS
Testes,epididymis,sperm duct

ihl-rat TCLo:500 ppm/7H (6-15D preg) TXAPA9 33,134,75
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

ihl-rat TCLo:1500 ppm/24H (1-9D preg) TXCYAC 11,45,78
EFFECTS ON FERTILITY
Post-implantation mortality

ihl-rat TCLo:500 ppm/7H (6-15D preg) EVHPAZ 41,171,81
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES

Musculoskeletal system

ihl-rat TCLo:250 ppm/6H (55D pre) JTEHD6 3,965,77
EFFECTS ON FERTILITY
Female fertility index

ihl-mus TCLo:30000 ppm/6H (5D male) EVHPAZ 21,71,77
EFFECTS ON FERTILITY
Pre-implantation mortality

ihl-mus TCLo:500 ppm/7H (6-15D preg) EVHPAZ 41,171,81
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

NO SIGNIFICANT

RISK LEVEL(Ca P65): 0.3 micrograms/day

----- PROTECTION AND FIRST AID -----

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (VINYL CHLORIDE)

Unknown, or above 3600 ppm: Open-circuit, self-contained breathing apparatus, pressure demand type, with full facepiece.

Not over 3600 ppm: Combination type C supplied air respirator, pressure demand type, with full or half facepiece, and auxiliary self-contained air supply; or

Not over 1000 ppm: Combination type, supplied air respirator continuous flow type, with full or half facepiece, and auxiliary self-contained air supply. / Type C, Supplied air respirator, continuous flow type, with full or half facepiece, helmet or hood.

Not over 100 ppm: (A) Combination type C supplied air respirator demand type; with full facepiece, and auxiliary self-contained air supply; or (B) Open-circuit self-contained breathing apparatus with full facepiece, in demand mode; or (C) Type C supplied air respirator, demand type, with full facepiece.

Not over 25 ppm: (A) A powered air-purifying respirator with hood, helmet, full or half facepiece, and a canister which provides a service life of at least 4 hours for concentrations of vinyl chloride up to 25 ppm, or (B) Gas mask, front- or back-mounted canister which provides a service life of at least 4 hours for concentrations of vinyl chloride up to 25 ppm.

Not over 10 ppm: (A) Combination type C supplied-air respirator, demand type, with half facepiece, and auxiliary self-contained air supply; or (B) Type C supplied-air respirator, demand type, with half facepiece; or (C) Any chemical cartridge respirator with an organic vapor cartridge which provides a service life of at least 1 hour for concentrations of vinyl chloride up to 10 ppm.

FIRST AID SOURCE: CT HCDB

EYE: None given

SKIN: None given

INHALATION: move to fresh air, keep quiet and warm, call doctor, artificial respirator.

INGESTION: None given

FIRST AID SOURCE: CHRIS Manual 1991

INHALATION: remove patient to fresh air and keep him quiet and warm; call a doctor; give artificial respiration if breathing stops.

EYES AND

SKIN: flush with plenty of water for at least 15 min.; for eyes, get medical attention; remove contaminated clothing.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of frostbite, thaw frosted parts with water. Keep victim quiet and maintain normal body temperature.

----- INITIAL INCIDENT RESPONSE -----

FIRE EXTINGUISHMENT: For small fires use dry chemical or carbon dioxide.
For large fires stop flow of gas. Cool exposed containers with water. CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).

DOT SHIPPING NAME: Vinyl chloride, inhibited

DOT ID NUMBER: UN1086

ERG90

GUIDE 17

* POTENTIAL HAZARDS *

*FIRE OR EXPLOSION

Extremely flammable.

May be ignited by heat, sparks and flames.

Vapors may travel to a source of ignition and flash back.

Container may explode violently in heat of fire.

Vapor explosion hazard indoors, outdoors or in sewers.

*HEALTH HAZARDS

May be poisonous if inhaled.

Contact may cause burns to skin and eyes.

Vapors may cause dizziness or suffocation.

Contact with liquid may cause frostbite.

Fire may produce irritating or poisonous gases.

* EMERGENCY ACTION *

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind, out of low areas, and ventilate closed spaces before entering.

Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection.

Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire.

CALL CHEMTREC AT 1-800-424-9300 AS SOON AS POSSIBLE, especially if there is no local hazardous team available.

***FIRE**

Let tank, tank car or tank truck burn unless leak can be stopped; with smaller tanks or cylinders, extinguish/isolate from other flammables.

Small Fires: Dry chemical or CO₂.

Large Fires: Water spray, fog or regular foam.

Move container from fire area if you can do it without risk.

For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.

Cool container with water using unmanned device until well after fire is out.

***SPILL OR LEAK**

Shut off ignition sources; no flares, smoking or flames in hazard area.

Stop leak if you can do it without risk.

Water spray may reduce vapors; but it may not prevent ignition in closed spaces.

Isolate area until gas has dispersed.

***FIRST AID**

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen.

In case of frostbite, thaw frosted parts with water.

Keep victim quiet and maintain normal body temperature.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement. The COMPILERS of the CHEMTOX database shall not be held liable for inaccuracies or omissions within this database, or in any of its printed or displayed output forms.

XYLENE

CHEMTOX DATA

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----- IDENTIFIERS -----

CHEMTOX RECORD 421
NAME: XYLENE
SYNONYMS: XYLENE (XYLOL); XYLOL; METHYL TOLUENE; BENZENE, DIMETHYL-;
DIMETHYLBENZENE; NCI-C55232; VIOLET 3; XYLOL (DOT); SOCAL
AQUATIC SOLVENT 3501
CAS: 1330-20-7 RTECS: ZE2100000
FORMULA: C8H10 MOL WT: 106.18
WLN: 1R X1
CHEMICAL CLASS: Aromatic hydrocarbon

LAST UPDATE OF THIS RECORD: 06/03/93

See other identifiers listed below under Regulations.

----- PROPERTIES -----

PHYSICAL DESCRIPTION: colorless liquid with aromatic odor
BOILING POINT: 412 K 138.8 C 281.9 F
MELTING POINT: 247 K -26.2 C -15.1 F
FLASH POINT: 300.35-305.35 K 27.2-32.2 C 80.9-89.9 F
AUTO IGNITION: NA
VAPOR PRESSURE: 6.7 mm @ 21 C
UEL: 7 %
LEL: 1 %
IONIZATION POTENTIAL (eV): 8.56
VAPOR DENSITY: 3.7 (air=1)
EVAPORATION RATE: 0.77 (n-BUTYL ACETATE=1)
SPECIFIC GRAVITY: 0.861 20C
DENSITY: 0.861 g/cc or 8.0073 lb/gal
WATER SOLUBILITY: VERY SL SOL
INCOMPATIBILITIES: strong oxidizers

REACTIVITY WITH WATER: No data on water reactivity
REACTIVITY WITH COMMON MATERIALS: No data
STABILITY DURING TRANSPORT: No Data
NEUTRALIZING AGENTS: No data
POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible
unburned vapors
ODOR DETECTED AT (ppm): 0.05
ODOR DESCRIPTION: LIKE BENZENE; CHARACTERISTIC AROMATIC
Source: CHRIS
100 % ODOR DETECTION: 0.4-20 ppm

----- REGULATIONS -----

DOT hazard class: 3 FLAMMABLE LIQUID
DOT guide: 27

Identification number: UN1307
DOT shipping name: XYLENES
Packing group: II
Label(s) required: FLAMMABLE LIQUID
Special provisions: T1
Packaging exceptions: 173.150
Non bulk packaging: 173.202
Bulk packaging: 173.242
Quantity limitations-
Passenger air/rail: 5 L
Cargo aircraft only: 60 L
Vessel stowage: B
Other stowage provisions:

STCC NUMBER: 4909350, 4909351

CLEAN WATER ACT Sect.307:No

CLEAN WATER ACT Sect.311:Yes

National Primary Drinking Water Regulations

Maximum Contaminant Levels (MCL): 10 mg/L (07/30/92)

Maximum Contaminant Level Goals (MCLG): 10 mg/L (07/30/92)

CLEAN AIR ACT: CAA '90 Listed

EPA WASTE NUMBER: U239,D001

CERCLA REF: Not listed

RQ DESIGNATION: C 1000 pounds (454 kg) CERCLA

SARA TPQ VALUE: Not listed

SARA Sect. 312

categories:

Acute toxicity: Irritant

Acute toxicity: adverse effect to target organs.

Chronic toxicity: adverse effect to target organ
after long period of exposure.

Chronic toxicity: reproductive toxin.

Fire hazard: flammable.

LISTED IN SARA Sect 313: Yes

de minimus CONCENTRATION: 1.0 percent

UNITED STATES POSTAL SERVICE MAILABILITY:

Hazard class: Not given

Mailability: Nonmailable

Max per parcel: 0

NFPA CODES:

HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with
self-contained breathing apparatus.

FLAMMABILITY (RED) : (3) This material can be ignited under almost all
temperature conditions.

REACTIVITY (YELLOW): (0) Stable even under fire conditions.

SPECIAL : Unspecified

----- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON -----

ACGIH TLV list "Threshold Limit Values for 1989-1990"
 California Assembly Bill 1803 Well Monitoring Chemicals.
 Clean Air Act Section 111 List.
 Clean Air Act of November 15, 1990. List of pollutants.
 Clean Water Act Section 311 Hazardous Chemicals List.
 DOT Hazardous Materials Table. 49 CFR 172.101
 EPA TSCA Chemical Inventory List 1986
 EPA TSCA Chemical Inventory List 1989
 EPA TSCA Chemical Inventory List 1990
 EPA TSCA Chemical Inventory List 1992
 EPA TSCA Test Submission (TSCATS) Database - April 1990
 EPA TSCA Test Submission (TSCATS) Database - September 1989
 Massachusetts Substance List.
 New Jersey DEQ100 list for release reporting.
 New Jersey Right To Know Substance List. (December 1987)
 OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
 OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992
 Pennsylvania Hazardous Substance List
 RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264
 RCRA Hazardous Waste
 SARA Section 313 Toxic Chemicals List
 Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
 Washington State Discarded Chemical Products List, November 17, 1989
 Wisconsin Air Toxics Control Regulation NR-445 (December 1988)
 XYLENE [1330-20-7]

----- TOXICITY DATA -----

SHORT TERM TOXICITY: Unknown

LONG TERM TOXICITY: unknown

TARGET ORGANS: CNS, eyes, gi tract, blood, liver, kidneys, skin

SYMPTOMS: DIZZ, EXCITEMENT, DROW, INCO, STAGGERING GAIT, IRRIT
 EYES, NOSE, THROAT, CORNEAL VACUOLIZATION, ANOREXIA,
 NAU, VOMIT, ABDOM PAIN; DERM Source: CHRIS

CONC IDLH: 1000ppm

NIOSH REL: 100 ppm Time weighted averages for 8-hour exposure
 434 mg/M3 Time weighted averages for 8-hour exposure
 200 ppm Ceiling exposures which shall at no time be
 exceeded(10-MIN) 868 mg/M3 Ceiling exposures which
 shall at no time be exceeded(10-MIN)

ACGIH TLV: TLV = 100ppm(435 mg/M3)

ACGIH STEL: STEL = 150 ppm(655 mg/M3)

OSHA PEL: Transitional Limits:
 PEL = 100 ppm(435mg/M3)
 Final Rule Limits:

TWA = 100 ppm (435 mg/M3)
STEL = 150 ppm(655 mg/M3)

MAK INFORMATION: 100 ppm
440 mg/M3
Substance with systemic effects, onset of effect less than or equal to 2 hrs: Peak = 2xMAK for 30 minutes, 4 times per shift of 8 hours.

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:

IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)
* orl-hmn LDLo:50 mg/kg YAKUD5 22,883,80
ihl-man LCLo:10000 ppm/6H BMJOAE 3,442,70

LD50 value: orl-rat LD50:4300 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:4300 mg/kg
ihl-rat LC50:5000 ppm/4H
ipr-rat LD50:2459 mg/kg
scu-rat LD50:1700 mg/kg
ipr-mus LD50:1548 mg/kg
ivn-rbt LDLo:129 mg/kg
ihl-gpg LCLo:450 ppm
ipr-gpg LDLo:2000 mg/kg
ipr-mam LDLo:2 gm/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)
ihl-rat TCLo:250 mg/m3/24H (7-15D preg) ATSUDG 8,425,85
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system
ihl-rat TCLo:50 mg/m3/6H (1-21D preg) JHEMA2 27,337,83
EFFECTS ON FERTILITY
Post-implantation mortality

EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Craniofacial(including nose and tongue)

ihl-rat TCLo:50 mg/m3/6H (1-21D preg) JHEMA2 27,337,83
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Other developmental abnormalities
EFFECTS ON NEWBORN
Growth statistics(e.g.,reduced weight gain)

ihl-rat TCLo:600 mg/m3/24H (7-15D preg) PCBRD2
163B,295,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

orl-mus TDLo:20600 ug/kg (6-15D preg) JTEHD6 9,97,82
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Craniofacial(including nose and tongue)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

orl-mus TDLo:31 mg/kg (6-15D preg) JTEHD6 9,97,82
EFFECTS ON FERTILITY
Post-implantation mortality

ihl-mus TCLo:4000 ppm/6H (6-12D preg) TJADAB 28,22A,83
EFFECTS ON NEWBORN
Growth statistics(e.g.,reduced weight gain)
EFFECTS ON NEWBORN
Physical

ihl-mus TCLo:2000 ppm/6H (6-12D preg) TJADAB 28,22A,83
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

ihl-mus TCLo:1 gm/m3/12H (6-15D preg) ATSUDG 8,425,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rbt TCLo:500 mg/m3/24H (7-20D preg) ATSUDG 8,425,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

----- EPA's IRIS DATA SUMMARY -----

Xylenes; CASRN 1330-20-7 (04/01/92)

II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Xylenes

CASRN -- 1330-20-7

Last Revised -- 03/01/91

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- D; not classifiable as to human carcinogenicity.

Basis -- Orally administered technical xylene mixtures did not result in significant increases in incidences in tumor responses in rats or mice of both sexes.

II.A.2. HUMAN CARCINOGENICITY DATA

None.

II.A.3. ANIMAL CARCINOGENICITY DATA

Inadequate. In an NTP (1986) study, 50 male and 50 female F344/N rats were treated by gavage with mixed xylenes in corn oil (60% m-xylene, 14% p-xylene, 9% o-xylene and 17% ethylbenzene) at dosages of 0, 250 or 500 mg/kg/day, 5 days/week for 103 weeks. Similarly, 50 male and 50 female B6C3F1 mice were treated with the same xylene mixture at dosages of 0, 500 or 1000 mg/kg/day. Animals were killed and examined histologically when moribund or after 104-105 weeks. An apparent dose-related increased mortality was

observed in male rats, but this difference was statistically significant for the high dose group, only. No other differences in survival between dosage groups of either sex were observed. Interstitial cell tumors of the testes could not be attributed to administration of the test compound observed in male rats (43/50 control, 38/50 low-dose and 41/49 high-dose). NTP (1986) reported that there were no significant changes in the incidence of neoplastic or nonneoplastic lesions in either the rats or mice that could be considered related to the mixed xylene treatment, and concluded that under the conditions of these 2-year gavage studies, there was "no evidence of carcinogenicity" of xylene (mixed) for rats or mice of either sex at any dosage tested.

Maltoni et al. (1985), in a limited study, reported higher incidences (compared with controls) of malignant tumors in male and female Sprague-Dawley rats treated by gavage with xylene in olive oil at 500 mg/kg/day, 4 or 5 days/week for 104 weeks. This study did not report survival rates or specific tumor types; therefore, the results cannot be interpreted.

Berenblum (1941) reported that "undiluted" xylene applied at weekly intervals produced one tumor-bearing animal out of 40 after 25 weeks in skin-painting experiments in mice. No control groups were described. Pound (1970) reported negative results in initiation-promotion experiments with xylene as the initiator and croton oil as the promotor.

II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

The frequency of sister chromatid exchanges and chromosomal aberrations were nearly identical between a group of 17 paint industry workers exposed to xylene and their respective referents (Haglund et al., 1980). In vitro, xylene caused no increase in the number of sister chromatid exchanges in human lymphocytes (Gerner-Smidt and Friedrich, 1978). Studies indicate that xylene isomers, technical grade xylene or mixed xylene are not mutagenic in tests with *Salmonella typhimurium* (Florin et al., 1980; NTP, 1986; Bos et al., 1981) nor in mutant reversion assays with *Escherichia coli* (McCarroll et al., 1981). Technical grade xylene, but not o- and m-xylene, was weakly mutagenic in *Drosophila* recessive lethal tests. Chromosomal aberrations were not increased in bone marrow cells of rats exposed to xylenes by inhalation (Donner et al., 1980).

II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

Not available.

___II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

Not available.

___II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

___II.D.1. EPA DOCUMENTATION

U.S. EPA. 1987. Drinking Water Criteria Document for Xylene. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Drinking Water, Washington, DC. ECAO-CIN-416. Final.

___II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The Drinking Water Criteria Document for Xylene has received Agency and external review.

Agency Work Group Review: 12/02/87

Verification Date: 12/02/87

___II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

Bruce Mintz / ODW -- (202)260-9569 / FTS 260-9569

W. Bruce Peirano / ORD -- (513)569-7540 / FTS 684-7540

----- PROTECTION AND FIRST AID -----

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

**** EXPOSED PERSONNEL SHOULD WASH:**

Promptly when skin becomes contaminated.

**** REMOVE CLOTHING:**

Immediately remove any clothing that becomes wet to avoid any flammability

**** REFERENCE: NIOSH**

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (XYLENE)

1000 ppm: Any chemical cartridge respirator with organic vapor cartridge(s). * Substance reported to cause eye irritation or damage may require eye protection. / Any powered air-purifying respirator with organic vapor cartridge(s). * Substance reported to cause eye irritation or damage may require eye protection. / Any supplied-air respirator. * Substance reported to cause eye irritation or damage may require eye protection. / Any self-contained breathing apparatus. * Substance reported to cause eye irritation or damage may require eye protection.

EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.: Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.

ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: NIOSH

EYE: irr immed

SKIN: soap wash promptly

INHALATION: art resp

INGESTION: no vomit

FIRST AID SOURCE: DOT Emergency Response Guide 1990.

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

----- INITIAL INCIDENT RESPONSE -----

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).

DOT SHIPPING NAME: XYLENES

DOT ID NUMBER: UN1307

ERG90

GUIDE 27

* POTENTIAL HAZARDS *

*FIRE OR EXPLOSION

Flammable/combustible material; may be ignited by heat, sparks or flames.

Vapors may travel to a source of ignition and flash back.

Container may explode in heat of fire.

Vapor explosion hazard indoors, outdoors or in sewers.

Runoff to sewer may create fire or explosion hazard.

***HEALTH HAZARDS**

May be poisonous if inhaled or absorbed through skin.

Vapors may cause dizziness or suffocation.

Contact may irritate or burn skin and eyes.

Fire may produce irritating or poisonous gases.

Runoff from fire control or dilution water may cause pollution.

*** EMERGENCY ACTION ***

Keep unnecessary people away; isolate hazard area and deny entry.

Stay upwind; keep out of low areas.

Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection.

Isolate for 1/2 mile in all direction if tank, rail car or tank truck is involved in fire.

CALL CHEMTREC AT 1-800-424-9300 FOR EMERGENCY ASSISTANCE. If water pollution occurs, notify the appropriate authorities.

***FIRE**

Small Fires: Dry chemical, CO₂, water spray or regular foam.

Large Fires: Water spray, fog or regular foam.

Move container from fire area if you can do it without risk.

Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks.

For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

Withdraw immediately in case of rising sound of venting safety device or any discoloration of tank due to fire.

***SPILL OR LEAK**

Shut off ignition sources; no flares, smoking or flames in hazard area.

Stop leak if you can do it without risk.

Water spray may reduce vapor; but it may not prevent ignition in closed spaces.

Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.

Large Spills: Dike far ahead of liquid spill for later disposal.

***FIRST AID**

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen.

In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water.

Remove and isolate contaminated clothing and shoes at the site.

M-XYLENE

All rights reserved.

See other identifiers listed below under Regulations.

DOT shipping name: XYLENES
Packing group: II
Label(s) required: FLAMMABLE LIQUID
Special provisions: T1
Packaging exceptions: 173.150
Non bulk packaging: 173.202
Bulk packaging: 173.242
Quantity limitations-
Passenger air/rail: 5 L
Cargo aircraft only: 60 L
Vessel stowage: B
Other stowage provisions:

STCC NUMBER: Not listed

CLEAN WATER ACT Sect.307:No
CLEAN WATER ACT Sect.311:Yes
CLEAN AIR ACT: CAA '90 Listed
EPA WASTE NUMBER: U239,D001
CERCLA REF: Not listed
RQ DESIGNATION: C 1000 pounds (454 kg) CERCLA
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:

Acute toxicity: Irritant
Acute toxicity: adverse effect to target organs.
Chronic toxicity: adverse effect to target organ
after long period of exposure.
Chronic toxicity: reproductive toxin.
Fire hazard: flammable.

LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 1.0 percent

UNITED STATES POSTAL SERVICE MAILABILITY:
Not given

NFPA CODES:

HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with
self-contained breathing apparatus.
FLAMMABILITY (RED) : (3) This material can be ignited under almost all
temperature conditions.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

----- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON -----

ACGIH TLV list "Threshold Limit Values for 1989-1990"
California Department of Health Services Drinking Water Action List.
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act of November 15, 1990. List of pollutants.

Clean Water Act Section 311 Hazardous Chemicals List.
 DOT Hazardous Materials Table. 49 CFR 172.101
 EPA Carcinogen Assessment Group List
 EPA TSCA 8(a) Preliminary Assessment Information Rule - effective 11/19/82
 EPA TSCA 8(d) Health and Safety Data Rule - effective date 10/04/82
 EPA TSCA Chemical Inventory List 1989
 EPA TSCA Chemical Inventory List 1990
 EPA TSCA Chemical Inventory List 1992
 EPA TSCA Test Submission (TSCATS) Database - April 1990
 EPA TSCA Test Submission (TSCATS) Database - September 1989
 Massachusetts Substance List.
 New Jersey Right To Know Substance List. (December 1987)
 OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
 OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992
 Pennsylvania Hazardous Substance List
 RCRA Hazardous Waste
 SARA Section 313 Toxic Chemicals List
 Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
 Washington State Discarded Chemical Products List, November 17, 1989
 m-XYLENE [108-38-3]

----- TOXICITY DATA -----

SHORT TERM TOXICITY: Unknown

LONG TERM TOXICITY: unknown

TARGET ORGANS: eyes, nervous system, liner, kidney

SYMPTOMS: Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress, and rapidly developing pulmonary edema. If ingested, causes nausea, vomiting, cramps, headache, and coma; can be fatal. Kidney and liver damage can occur. Source: CHRIS

CONC IDLH: 1000ppm

NIOSH REL: 100 ppm Time weighted averages for 8-hour exposure
 434 mg/M3 Time weighted averages for 8-hour exposure
 200 ppm Ceiling exposures which shall at no time be exceeded(10-MIN)
 868 mg/M3 Ceiling exposures which shall at no time be exceeded(10-MIN)

ACGIH TLV: TLV = 100ppm(435 mg/M3)
 ACGIH STEL: STEL = 150 ppm(655 mg/M3)

OSHA PEL: Transitional Limits:
 PEL = 100 ppm(435mg/M3)
 Final Rule Limits:
 TWA = 100 ppm (435 mg/M3)
 STEL = 150 ppm(655 mg/M3)

MAK INFORMATION: Not listed

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:

IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)

ihl-man TCLo:424 mg/m3/6H/6D TOLED5 1000(Sp Iss 1),74,80
BEHAVIORAL
Changes in motor activity(specific assay)

LD50 value: orl-rat LD50:5 gm/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:5 gm/kg
ihl-rat LCLo:8000 ppm/4H
ihl-mus LCLo:2010 ppm/24H
ipr-mus LD50:1739 mg/kg
skn-rbt LD50:14100 mg/kg
ipr-mam LDLo:2 gm/kg
scu-mam LDLo:5 gm/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):

This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

ihl-rat TCLo:3000 mg/m3/24H (7-14D preg) TXCYAC
18,61,80

EFFECTS ON FERTILITY

Pre-implantation mortality

EFFECTS ON EMBRYO OR FETUS

Fetotoxicity(except death,e.g.,stunted fetus)

SPECIFIC DEVELOPMENTAL ABNORMALITIES

Musculoskeletal system

orl-mus TDLo:12 mg/kg (12-15D preg) APTOD9 19,A22,80

SPECIFIC DEVELOPMENTAL ABNORMALITIES

Craniofacial(including nose and tongue)

orl-mus TDLo:30 mg/kg (6-15D preg) APTOD9 19,A22,80

EFFECTS ON FERTILITY

Litter size(# fetuses per litter;measured before birth)

ihl-mus TCLo:500 mg/m3/12H (6-15D preg) ATSUDG 8,425,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

----- PROTECTION AND FIRST AID -----

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

FIRST AID SOURCE: CHRIS Manual 1991
INHALATION: remove to fresh air; administer artificial respiration and oxygen if required; call a doctor.
INGESTION: do NOT induce vomiting; call a doctor.
EYES: flush with water for at least 15 min.
SKIN: wipe off, wash with soap and water.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

----- INITIAL INCIDENT RESPONSE -----

FIRE EXTINGUISHMENT: Foam, dry chemical, or carbon dioxide. Note: Water may be ineffective. CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).

DOT SHIPPING NAME: XYLENES
DOT ID NUMBER: UN1307

ERG90

GUIDE 27

* POTENTIAL HAZARDS *

*FIRE OR EXPLOSION

Flammable/combustible material; may be ignited by heat, sparks or flames.

Vapors may travel to a source of ignition and flash back.

Container may explode in heat of fire.

Vapor explosion hazard indoors, outdoors or in sewers.

Runoff to sewer may create fire or explosion hazard.

*HEALTH HAZARDS

May be poisonous if inhaled or absorbed through skin.

Vapors may cause dizziness or suffocation.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

* EMERGENCY ACTION *

Keep unnecessary people away; isolate hazard area and deny entry.
Stay upwind; keep out of low areas.
Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection.
Isolate for 1/2 mile in all direction if tank, rail car or tank truck is involved in fire.
CALL CHEMTREC AT 1-800-424-9300 FOR EMERGENCY ASSISTANCE. If water pollution occurs, notify the appropriate authorities.

*FIRE

Small Fires: Dry chemical, CO₂, water spray or regular foam.
Large Fires: Water spray, fog or regular foam.
Move container from fire area if you can do it without risk.
Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks.
For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn.
Withdraw immediately in case of rising sound of venting safety device or any discoloration of tank due to fire.

*SPILL OR LEAK

Shut off ignition sources; no flares, smoking or flames in hazard area.
Stop leak if you can do it without risk.
Water spray may reduce vapor; but it may not prevent ignition in closed spaces.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Large Spills: Dike far ahead of liquid spill for later disposal.

*FIRST AID

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen.
In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water.
Remove and isolate contaminated clothing and shoes at the site.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement. The COMPILERS of the CHEMTOX database shall not be held liable for inaccuracies or omissions within this database, or in any of its printed or displayed output forms.

CHEMTOX DATA

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----- IDENTIFIERS -----

CHEMTOX RECORD 512

LAST UPDATE OF THIS RECORD: 06/03/93

NAME: o-XYLENE

SYNONYMS: o-DIMETHYLBENZENE; 1,2-DIMETHYLBENZENE; o-METHYLTOLUENE;
1,2-XYLENE; o-XYLOL; 1,2-DIMETHYLBENZENE,XYLOL; O-XYLENE;
O-DIMETHYLBENZENE

CAS: 95-47-6

RTECS: ZE2450000

FORMULA: C8H10

MOL WT: 106.18

WLN: 1R B1

CHEMICAL CLASS: Aromatic hydrocarbon

See other identifiers listed below under Regulations.

----- PROPERTIES -----

PHYSICAL DESCRIPTION: colorless watery liquid with a sweet odor

BOILING POINT: 417.40 K 144.2 C 291.6 F

MELTING POINT: 247.8 K -25.4 C -13.7 F

FLASH POINT: 305 K 31.85 C 89.3 F

AUTO IGNITION: 738 K 464.8 C 1360.4 F

CRITICAL TEMP: 630.3 K 357.15 C 674.87 F

CRITICAL PRESS: 3.732 kN/M2 36.7 atm 540 psia

HEAT OF VAP: 149 Btu/lb 82.75 cal/g 3.462x E5 J/kg

HEAT OF COMB: -17558 Btu/lb -9761 cal/g -408x E5 J/kg

VAPOR PRESSURE: 10mm @ 32.1 C

UEL: 6%

LEL: 1%

IONIZATION POTENTIAL (eV): 7.5

VAPOR DENSITY: No data

EVAPORATION RATE: 0.54 (n-BUTYL ACETATE=1)

SPECIFIC GRAVITY: 0.880 20C

DENSITY: 0.880g/mL @ 20 C

WATER SOLUBILITY: VERY SL SOL

INCOMPATIBILITIES: strong ox

REACTIVITY WITH WATER: INSOLUBLE Source: SAX

REACTIVITY WITH COMMON MATERIALS: MISCIBLE IN ABSOLUTE ALCOHOL, ETHER
Source: SAX

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: ACRID SMOKE AND FUMES

ODOR DETECTED AT (ppm): 0.05 ppm

ODOR DESCRIPTION: aromatic Source: CHRIS

100 % ODOR DETECTION: No data

----- REGULATIONS -----

DOT hazard class: 3 FLAMMABLE LIQUID
DOT guide: 27
Identification number: UN1307
DOT shipping name: XYLENES
Packing group: II
Label(s) required: FLAMMABLE LIQUID
Special provisions: T1
Packaging exceptions: 173.150
Non bulk packaging: 173.202
Bulk packaging: 173.242
Quantity limitations-
Passenger air/rail: 5 L
Cargo aircraft only: 60 L
Vessel stowage: B
Other stowage provisions:

STCC NUMBER: Not listed

CLEAN WATER ACT Sect.307:No
CLEAN WATER ACT Sect.311:Yes
CLEAN AIR ACT: CAA '90 Listed
EPA WASTE NUMBER: U239,D001
CERCLA REF: Y
RQ DESIGNATION: C 1000 pounds (454 kg) CERCLA
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:

Acute toxicity: adverse effect to target organs.
Chronic toxicity: adverse effect to target organ
after long period of exposure.
Chronic toxicity: reproductive toxin.
Fire hazard: flammable.

LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 1.0 percent

UNITED STATES POSTAL SERVICE MAILABILITY:
Not given

NFPA CODES:

HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with
self-contained breathing apparatus.
FLAMMABILITY (RED) : (3) This material can be ignited under almost all
temperature conditions.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

----- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON -----

ACGIH TLV list "Threshold Limit Values for 1989-1990"

California Department of Health Services Drinking Water Action List.
 Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
 Clean Air Act Section 111 List.
 Clean Air Act of November 15, 1990. List of pollutants.
 Clean Water Act Section 311 Hazardous Chemicals List.
 DOT Hazardous Materials Table. 49 CFR 172.101
 EPA Carcinogen Assessment Group List
 EPA TSCA 8(a) Preliminary Assessment Information Rule - effective 11/19/82
 EPA TSCA 8(d) Health and Safety Data Rule - effective date 10/04/82
 EPA TSCA Chemical Inventory List 1989
 EPA TSCA Chemical Inventory List 1990
 EPA TSCA Chemical Inventory List 1992
 EPA TSCA Test Submission (TSCATS) Database - April 1990
 EPA TSCA Test Submission (TSCATS) Database - September 1989
 Massachusetts Substance List.
 New Jersey Right To Know Substance List. (December 1987)
 OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
 OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992
 Pennsylvania Hazardous Substance List
 RCRA Hazardous Waste
 SARA Section 313 Toxic Chemicals List
 Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
 Washington State Discarded Chemical Products List, November 17, 1989
 o-XYLENE [95-47-6]

----- TOXICITY DATA -----

SHORT TERM TOXICITY: Unknown

LONG TERM TOXICITY: unknown

TARGET ORGANS: CNS, eyes, gi tract, blood, liver, kidneys, skin

SYMPTOMS: Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress, and rapidly developing pulmonary edema. If ingested, causes nausea, vomiting, cramps, headache, and coma. Can be fatal. Kidney and liver damage can occur. Source: CHRIS

CONC IDLH: 1000ppm

NIOSH REL: 100 ppm Time weighted averages for 8-hour exposure
 434 mg/M3 Time weighted averages for 8-hour exposure
 200 ppm Ceiling exposures which shall at no time be exceeded(10-MIN)
 868 mg/M3 Ceiling exposures which shall at no time be exceeded(10-MIN)

ACGIH TLV: TLV = 100ppm(435 mg/M3)

ACGIH STEL: STEL = 150 ppm(655 mg/M3)

OSHA PEL: Transitional Limits:

PEL = 100 ppm(435mg/M3)
Final Rule Limits:
TWA = 100 ppm (435 mg/M3)
STEL = 150 ppm(655 mg/M3)

MAK INFORMATION: Not listed

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:

IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)
* ihl-hmn LCLo:6125 ppm/12H YAKUD5 22,883,80

LD50 value: No LD50 in RTECS 1992

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LDLo:5 gm/kg
ihl-rat LCLo:6125 ppm/12H
ihl-mus LCLo:30 gm/m3
ipr-mus LD50:1364 mg/kg
ipr-mam LDLo:1500 mg/kg
scu-mam LDLo:2500 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):

This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

ihl-rat TCLo:150 mg/m3/24H (7-14D preg) TXCYAC 18,61,80
EFFECTS ON EMBRYO OR FETUS
Extra embryonic features(e.g.,placenta,umbilical
cord)

ihl-rat TCLo:1500 mg/m3/24H (7-14D preg) TXCYAC -
18,61,80
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

ihl-rat TCLo:3000 mg/m3/24H (7-14D preg) TXCYAC
18,61,80
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ipr-rat TDLo:500 mg/kg (2D male) ARANDR 11,233,83
PATERNAL EFFECTS
Spermatogenesis

----- PROTECTION AND FIRST AID -----

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

FIRST AID SOURCE: NIOSH
csds

EYE: remove contact lenses. flush eyes with water or normal saline solution for at least 20-30 minutes. seek medical attention at once.

SKIN: flood all affected areas of the body with water. remove contaminated clothing immediately under water stream. use soap. isolate contaminated clothing to prevent contact by others.

INHALATION: remove victim to fresh air immediately. proper respiratory protection must be provided to any rescuer. if coughing, difficulty with breathing or other symptoms develop. seek medical attention at once.

INGESTION: if no convulsions, give water or milk to dilute substance. assure that victim's airway is unobstructed and contact physician immediately for advice on whether or not to induce vomiting.

FIRST AID SOURCE: CHRIS Manual 1991

INHALATION: remove to fresh air; administer artificial respiration and oxygen if required; call a doctor.

INGESTION: do NOT induce vomiting; call a doctor.

EYES: flush with water for at least 15 min.

SKIN: wipe off, wash with soap and water.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

----- INITIAL INCIDENT RESPONSE -----

FIRE EXTINGUISHMENT: Foam, dry chemical, or carbon dioxide. Note: Water may be ineffective. CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).

DOT SHIPPING NAME: XYLENES

DOT ID NUMBER: UN1307

ERG90

GUIDE 27

* POTENTIAL HAZARDS *

***FIRE OR EXPLOSION**

Flammable/combustible material; may be ignited by heat, sparks or flames.

Vapors may travel to a source of ignition and flash back.

Container may explode in heat of fire.

Vapor explosion hazard indoors, outdoors or in sewers.

Runoff to sewer may create fire or explosion hazard.

***HEALTH HAZARDS**

May be poisonous if inhaled or absorbed through skin.

Vapors may cause dizziness or suffocation.

Contact may irritate or burn skin and eyes.

Fire may produce irritating or poisonous gases.

Runoff from fire control or dilution water may cause pollution.

*** EMERGENCY ACTION ***

Keep unnecessary people away; isolate hazard area and deny entry.

Stay upwind; keep out of low areas.

Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection.

Isolate for 1/2 mile in all direction if tank, rail car or tank truck is involved in fire.

CALL CHEMTREC AT 1-800-424-9300 FOR EMERGENCY ASSISTANCE. If water pollution occurs, notify the appropriate authorities.

***FIRE**

Small Fires: Dry chemical, CO2, water spray or regular foam.

Large Fires: Water spray, fog or regular foam.

Move container from fire area if you can do it without risk.

Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks.

For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

Withdraw immediately in case of rising sound of venting safety device or any discoloration of tank due to fire.

***SPILL OR LEAK**

Shut off ignition sources; no flares, smoking or flames in hazard area.

Stop leak if you can do it without risk.

Water spray may reduce vapor; but it may not prevent ignition in closed spaces.

Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.

Large Spills: Dike far ahead of liquid spill for later disposal.

***FIRST AID**

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen.

In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water.

Remove and isolate contaminated clothing and shoes at the site.

P-XYLENE

CHEMTOX DATA

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----- IDENTIFIERS -----

CHEMTOX RECORD 3555 LAST UPDATE OF THIS RECORD: 06/03/93
NAME: P-XYLENE
SYNONYMS: 1,4-DIMETHYLBENZENE; p-DIMETHYLBENZENE; p-METHYLTOLUENE;
 p-XYLOL; 1,4-XYLENE
CAS: 106-42-3 RTECS: ZE2625000
FORMULA: C8H10 MOL WT: 106.18
WLN: 1R D1
CHEMICAL CLASS: Aromatic hydrocarbon

See other identifiers listed below under Regulations.

----- PROPERTIES -----

PHYSICAL DESCRIPTION: colorless liquid; mobile flammable liquid; clear
 plates or prisms

BOILING POINT:	411.45 K	138.3 C	280.9 F
MELTING POINT:	286.45 K	13.3 C	55.9 F
FLASH POINT:	300 K	26.85 C	80.3 F
AUTO IGNITION:	797.85 K	524.7 C	1468.1 F
CRITICAL TEMP:	616.2 K	343.05 C	649.49 F
CRITICAL PRESS:	3.510 kN/M2	34.6 atm	508 psia
HEAT OF VAP:	150 Btu/lb	83.3 cal/g	3.485x E5 J/kg
HEAT OF COMB:	-17559 Btu/lb	-9762 cal/g	-408x E5 J/kg
VAPOR PRESSURE:	10mm @ 27.3 C		
UEL:	7.0 %		
LEL:	1.1 %		
VAPOR DENSITY:	3.66 (air=1)		
EVAPORATION RATE:	0.72 (n-BUTYL ACETATE=1)		
SPECIFIC GRAVITY:	0.8611 @ 20 C		
DENSITY:	0.8611 g/mL @ 20 C		
WATER SOLUBILITY:	INSOLUBLE		
INCOMPATIBILITIES:	may react with oxidizing materials; acetic acid and air; nitric acid 1,3-dichloro-5, 5-dimethyl-2, 4-imid-azolidindione ■ sax		

REACTIVITY WITH WATER: INSOLUBLE Source: SAX, MI
REACTIVITY WITH COMMON MATERIALS: SOLUBLE IN ALCOHOL, ETHER, ORGANIC
SOLVENTS Source: SAX, MI
STABILITY DURING TRANSPORT: No Data
NEUTRALIZING AGENTS: No data
POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: ACRID SMOKE AND FUMES ■ SAX
ODOR DETECTED AT (ppm): 0.05 ppm
ODOR DESCRIPTION: aromatic Source: CHRIS
100 % ODOR DETECTION: No data

----- REGULATIONS -----

DOT hazard class: 3 FLAMMABLE LIQUID
 DOT guide: 27
 Identification number: UN1307
 DOT shipping name: Xylenes
 Packing group: II - III
 Label(s) required: FLAMMABLE LIQUID - FLAMMABLE LIQUID
 Special provisions: T1B1, T1
 Packaging exceptions: 173.150 150
 Non bulk packaging: 173.202 203
 Bulk packaging: 173.242 242
 Quantity limitations-
 Passenger air/rail: 5 L 60 L
 Cargo aircraft only: 60 L 220 L
 Vessel stowage: B A
 Other stowage provisions:

STCC NUMBER: Not listed

CLEAN WATER ACT Sect.307:No
 CLEAN WATER ACT Sect.311:Yes
 CLEAN AIR ACT: CAA '90 Listed
 EPA WASTE NUMBER: U239,D001
 CERCLA REF: Not listed
 RQ DESIGNATION: C 1000 pounds (454 kg) CERCLA
 SARA TPQ VALUE: Not listed
 SARA Sect. 312
 categories:

Acute toxicity: adverse effect to target organs.
 Chronic toxicity: adverse effect to target organ
 after long period of exposure.
 Chronic toxicity: reproductive toxin.
 Fire hazard: flammable.

LISTED IN SARA Sect 313: Yes
 de minimus CONCENTRATION: 1.0 percent

UNITED STATES POSTAL SERVICE MAILABILITY:
 Not given

NFPA CODES:
 HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with
 self-contained breathing apparatus.
 FLAMMABILITY (RED) : (3) This material can be ignited under almost all
 temperature conditions.
 REACTIVITY (YELLOW): (0) Stable even under fire conditions.
 SPECIAL : Unspecified

----- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON -----

ACGIH TLV list "Threshold Limit Values for 1989-1990"
 California Department of Health Services Drinking Water Action List.
 Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
 Clean Air Act Section 111 List.
 Clean Air Act of November 15, 1990. List of pollutants.
 Clean Water Act Section 311 Hazardous Chemicals List.
 DOT Hazardous Materials Table. 49 CFR 172.101
 EPA Carcinogen Assessment Group List
 EPA TSCA 8(a) Preliminary Assessment Information Rule - effective 11/19/82
 EPA TSCA 8(d) Health and Safety Data Rule - effective date 10/04/82
 EPA TSCA Chemical Inventory List 1989
 EPA TSCA Chemical Inventory List 1990
 EPA TSCA Chemical Inventory List 1992
 EPA TSCA Test Submission (TSCATS) Database - April 1990
 EPA TSCA Test Submission (TSCATS) Database - September 1989
 Massachusetts Substance List.
 New Jersey Right To Know Substance List. (December 1987)
 OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
 OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992
 P-XYLENE [106-42-3]
 Pennsylvania Hazardous Substance List
 RCRA Hazardous Waste
 SARA Section 313 Toxic Chemicals List
 Second Third Wastes List. 40 CFR 268.11. 54 FR 26594 (June 23, 1989)
 Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
 Washington State Discarded Chemical Products List, November 17, 1989

----- TOXICITY DATA -----

SHORT TERM TOXICITY: Unknown

LONG TERM TOXICITY: local irritant, may be narcotic in high concentrations; kidney and liver damage; dermatitis, blood disease. ** source: ■csds■sax■hcl3

TARGET ORGANS: CNS, eyes, git, blood, liver, kidneys, skin.

SYMPTOMS: Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress, and rapidly developing pulmonary edema. If ingested, causes nausea, vomiting, cramps, headache, and coma. Can be fatal. Kidney and liver damage can occur. Source: CHRIS

CONC IDLH: 1000ppm

NIOSH REL: 100 ppm Time weighted averages for 8-hour exposure
 434 mg/M3 Time weighted averages for 8-hour exposure
 200 ppm Ceiling exposures which shall at no time be exceeded(10-MIN)
 868 mg/M3 Ceiling exposures which shall at no time be exceeded(10-MIN)

ACGIH TLV: TLV = 100ppm(435 mg/M3)
ACGIH STEL: STEL = 150 ppm(655 mg/M3)

OSHA PEL: Transitional Limits:
PEL = 100 ppm(435mg/M3)
Final Rule Limits:
TWA = 100 ppm (435 mg/M3)
STEL = 150 ppm(655 mg/M3)

MAK INFORMATION: Not listed

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:

IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

LD50 value: orl-rat LD50:5 gm/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:5 gm/kg
ihl-rat LC50:4550 ppm/4H
ipr-rat LD50:3810 mg/kg
ihl-mus LCLo:15 gm/m3
ipr-mus LD50:2110 mg/kg
ipr-mam LDLo:2 gm/kg
scu-mam LDLo:5 gm/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):

This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

ihl-rat TCLo:3000 mg/m3/24H (9-10D preg) TXCYAC
19,263,81

EFFECTS ON EMBRYO OR FETUS

Fetotoxicity(except death,e.g.,stunted fetus)

MATERNAL EFFECTS

Other effects on female

ENDOCRINE

Estrogenic

ihl-rat TCLo:150 mg/m3/24H (7-14D preg) TXCYAC 18,61,80
EFFECTS ON EMBRYO OR FETUS

Extra embryonic features(e.g.,placenta,umbilical cord)

SPECIFIC DEVELOPMENTAL ABNORMALITIES

Musculoskeletal system

ihl-rat TCLo:3000 mg/m3/24H (7-14D preg) TXCYAC 18,61,80

EFFECTS ON FERTILITY

Post-implantation mortality

EFFECTS ON EMBRYO OR FETUS

Fetotoxicity(except death,e.g.,stunted fetus)

orl-mus TDLo:12 mg/kg (12-15D preg) APTOD9 19,A22,80

SPECIFIC DEVELOPMENTAL ABNORMALITIES

Craniofacial(including nose and tongue)

ihl-mus TCLo:500 mg/m3/12H (6-15D preg) ATSUDG 8,425,85

EFFECTS ON EMBRYO OR FETUS

Fetotoxicity(except death,e.g.,stunted fetus)

SPECIFIC DEVELOPMENTAL ABNORMALITIES

Musculoskeletal system

----- PROTECTION AND FIRST AID -----

PROTECTION SUGGESTED

FROM THE CHRIS MANUAL:

FIRST AID SOURCE: CHRIS Manual 1991

INHALATION: remove to fresh air; administer artificial respiration and oxygen if required; call a doctor.

INGESTION: do NOT induce vomiting; call a doctor.

EYES: flush with water for at least 15 min.

SKIN: wipe off, wash with soap and water.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

----- INITIAL INCIDENT RESPONSE -----

FIRE EXTINGUISHMENT: Foam, dry chemical, or carbon dioxide. Note: Water may be ineffective. CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).

DOT SHIPPING NAME: Xylenes

DOT ID NUMBER: UN1307

* POTENTIAL HAZARDS *

*FIRE OR EXPLOSION

Flammable/combustible material; may be ignited by heat, sparks or flames.

Vapors may travel to a source of ignition and flash back.

Container may explode in heat of fire.

Vapor explosion hazard indoors, outdoors or in sewers.

Runoff to sewer may create fire or explosion hazard.

*HEALTH HAZARDS

May be poisonous if inhaled or absorbed through skin.

Vapors may cause dizziness or suffocation.

Contact may irritate or burn skin and eyes.

Fire may produce irritating or poisonous gases.

Runoff from fire control or dilution water may cause pollution.

* EMERGENCY ACTION *

Keep unnecessary people away; isolate hazard area and deny entry.

Stay upwind; keep out of low areas.

Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection.

Isolate for 1/2 mile in all direction if tank, rail car or tank truck is involved in fire.

CALL CHEMTREC AT 1-800-424-9300 FOR EMERGENCY ASSISTANCE. If water pollution occurs, notify the appropriate authorities.

*FIRE

Small Fires: Dry chemical, CO₂, water spray or regular foam.

Large Fires: Water spray, fog or regular foam.

Move container from fire area if you can do it without risk.

Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks.

For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

Withdraw immediately in case of rising sound of venting safety device or any discoloration of tank due to fire.

*SPILL OR LEAK

Shut off ignition sources; no flares, smoking or flames in hazard area. Stop leak if you can do it without risk.

Water spray may reduce vapor; but it may not prevent ignition in closed spaces.

Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.

Large Spills: Dike far ahead of liquid spill for later disposal.

*FIRST AID

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen.

In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water.

Remove and isolate contaminated clothing and shoes at the site.

B

SEVERE WEATHER

B

SEVERE WEATHER

When projects are conducted outside, the potential for severe weather must be considered. Thunderstorms, tornados and winter storms can develop quickly, jeopardizing your safety. The following emergency procedures are to be followed in the event of severe weather.

THUNDERSTORMS AND LIGHTNING

Monitor weather conditions at all times while working. At a sign of an impending storm - increased cloudiness, darkened skies, increased wind - listen to a radio for the latest weather information.

When a thunderstorm accompanied by lightning is in the project area, cease work immediately. All powered equipment, such as drill rigs, are to be shut down.

Seek shelter inside nearby buildings or trailers. If there are no buildings nearby, seek shelter inside your vehicle.

If you are caught outside, do not stand beneath tall, isolated trees or telephone poles. Avoid areas projecting above the landscape such as hill tops. In open areas, go to a low place such as a ravine or valley. Stay away from open water, metal equipment, wire fences and metal pipes. If you are in a group of people in the open, spread out, staying several yards apart.

If you are caught in a level field or open area far from shelter and you feel your hair stand on end, lightning may be about to strike you. Drop to your knees and bend forward, putting your hands on your knees. You should minimize the body area in direct contact with the ground. Do not lie flat on the ground.

If someone has been struck by lightning, monitor life signs and begin administering mouth-to-mouth resuscitation or cardiopulmonary resuscitation as needed. Send for help.

Check conscious victims for burns, especially at the fingers and toes and next to buckles and jewelry. Administer first aid for shock. Do not let the victim walk around.

TORNADOS

Tornados usually develop from thunderstorms and normally occur at the trailing edge of the storm. Most tornados occur in the months of April, May, June, and July in the late afternoon and early evening hours.

When storms are predicted for the project area, monitor weather conditions on a radio. A tornado watch is issued when favorable conditions exist for the development of a tornado. A tornado warning is issued by the local weather service office whenever a tornado has actually been sighted or is strongly indicated by radar.

If a tornado warning is issued, seek shelter immediately. If there are permanent buildings located on site, go there immediately, moving toward interior hallways or small rooms on the lowest floor.

If a tornado warning is issued and you are in a vehicle or a site trailer, leave and go to the nearest building. If there are no buildings nearby, go in the nearest ditch, ravine or culvert, with your hands shielding your head.

If a tornado is sighted or a warning issued while you are in open country, lie flat in a ditch or depression. Hold onto something on the ground, such as a bush or wooden fence post, if possible.

Once a tornado has passed the site, site personnel are to assemble at the designated assembly area to determine if anyone is missing. Administer first aid and seek medical attention as needed.

WINTER STORMS

When snow or ice storms are predicted for the project area, site personnel should monitor weather conditions on a radio. A winter storm watch is issued when a

storm has formed and is approaching the area. A winter storm warning is issued when a storm is imminent and immediate action is to be taken.

When a storm watch is issued, monitor weather conditions and prepare to halt site activities. Notify the project manager of the situation. Seek shelter at site buildings or leave the site and seek warm shelter.

If you are caught in a severe winter storm while traveling, seek warm shelter if road conditions prevent safe travel.

If you are stranded in a vehicle during a winter storm:

- Stay in the vehicle. Disorientation comes quickly in blowing and drifting snow.
- Wait for help.
- Keep a window open an inch or so to avoid carbon monoxide poisoning.
- Run the engine and heater sparingly. -
- Keep watch - do not let everyone sleep at the same time.
- Exercise occasionally.

C

TEMPERATURE STRESS

C

TEMPERATURE STRESS

This section outlines the signs and symptoms of temperature stress in addition to the engineering controls, work practice controls and other management techniques that should be used to reduce temperature stress. Individual susceptibilities to temperature stress need to be considered and used to pace the work being performed with the most susceptible person controlling the work/rest schedule. Monitoring for heat stress is to be performed as detailed in this section.

COLD STRESS

Reduction

The following engineering controls are recommended for reduction of cold stress:

- Use general or spot heating to increase temperature at work site if this does not create a hazardous situation.
- Shield work area from wind.
- Cover metal handles of tools and equipment with thermal insulating materials.
- Do not sit on unprotected metal chair seats.
- Use heated rest areas if work is to be performed in an equivalent chill temperature of 20°F or below.

The following work practice controls are recommended to reduce cold stress:

- Drink warm, caffeine-free, sweet, non-alcoholic drinks or soup frequently.
- Schedule work for warmest part of the day.
- Use heated rest areas regularly.
- Use the buddy system. Do not work alone. Observe your co-workers for signs and symptoms of cold stress.
- Allow and encourage workers to pace themselves and take extra breaks when needed. The work schedule should be set by the person most susceptible to cold stress. Do not pressure someone to work beyond their capabilities.
- Whenever possible, allow new workers time to adjust to working in a cold environment before working full time. Ideally, acclimation should occur over five days: 20% Day 1 with a 20% increase on each successive day.
- When possible, arrange the work to minimize standing or sitting still for long periods of time.
- Reorganize work procedures so as much of a job as possible can be done in a warm environment.
- Avoid overtime.
- Remove outer layer of clothing when entering warm shelter.
- If clothes are wet, change to dry work clothes before returning to work in cold. If not possible, loosen clothing to facilitate evaporation of sweat.
- Develop and adhere to a work-rest schedule, using the guidelines which follow.

Air Temperature with Sunny Sky (degrees F)	Work/Break Schedule (minutes)				
	no <u>wind</u>	5 mph <u>wind</u>	10 mph <u>wind</u>	15 mph <u>wind</u>	20 mph <u>wind</u>
-05 to -09	110/10	110/10	75/10	55/10	40/10
-10 to -14	110/10	75/10	55/10	40/10	30/10
-15 to -19	75/10	55/10	40/10	30/10	cease
-20 to -24	55/10	40/10	30/10	cease	cease
-25 to -29	40/10	30/10	cease	cease	cease
-30 to -34	30/10	cease	cease	cease	cease
-35 & below	cease	cease	cease	cease	cease

NOTES

These recommendations and guidelines are adapted from *Threshold Limit Values and Biological Exposure Indices for 1990-1991*, published by the American Conference of Governmental Industrial Hygienists, Cincinnati, OH.

05 mph wind - light flag moves, 10 mph wind - light flag fully extended, 15 mph wind - raises newspaper sheet, 20 mph wind - blowing and drifting snow

The practicality of working under a work-rest schedule, together with the ability of the necessary equipment to function properly in cold weather, may be more restrictive than the health hazards and also need to be considered. The cold stress schedules noted above apply to light or sedentary work activities. Light to moderate work activities can be moved up one level, moderate to heavy work activities can be moved up two levels if workers are acclimated, have proper protective clothing and show no signs of cold stress.

For example:

You are shoveling material (which is generally considered heavy work) on a sunny day with a 5 mph wind. The temperature is -20 degrees F. You could use a 110 minutes work/10 minutes warm-up schedule if you were acclimated to cold weather work. A 75 minutes work/10 minutes warm-up could be used if you were not acclimated to cold weather work.

Signs and Symptoms

Send a worker to warm shelter immediately if any of the following symptoms are noted:

- Heavy shivering
- Frostnip (skin turns white)
- Feeling of excessive fatigue
- Drowsiness
- Euphoria

First Aid

Take victim to a warm area. Remove the outer layers of clothing. Gently warm the affected area, submerge it in tepid water if possible but do not rub. If there is evidence of frostbite, obtain medical attention immediately.

HEAT STRESS**Reduction**

While site specific conditions need to be considered, the following guidelines are recommended to prevent or reduce the effects of heat stress.

- Develop and adhere to a work-rest schedule using the guidelines at the end of this section.
- Take breaks in cool areas.
- Drink fluids hourly. The fluids should be caffeine-free and non-alcoholic. Water or electrolyte-replacement drinks, such as Gatorade™, are good choices. Do not wait until you are thirsty. Your normal thirst mechanism is not sufficient to overcome the effects of dehydration. If you feel thirsty, you are already becoming dehydrated.
- Schedule work for the cooler part of the day -- early morning and/or early evening.
- Allow and encourage workers to pace themselves and take extra breaks when needed. The work schedule should be set by the person most susceptible to heat stress. Do not pressure someone to work beyond their capabilities.
- Whenever possible, allow new workers time to adjust to working in a hot environment before working full time. Ideally, acclimation should occur over five days: 20% Day 1 with a 20% increase on each successive day.
- Avoid overtime.
- Use the buddy system. Never work alone and watch your co-workers for signs of heat stress.

Personal Monitoring

At each work break, count your pulse during a 30 second period as early as possible in the rest period.

- If your heart rates exceeds 110 beats per minute (BPM) at beginning of rest period, shorten your next work cycle by 1/3 and keep the rest period the same.
- If your heart rate still exceeds 110 BPM at next rest period, shorten the following work cycle by 1/3.

At the beginning and end of each work shift, measure your weight, ± 0.25 LB, wearing similar clothes. You should not lose more than 1.5 % of your total body weight in a work day. If you do, drink fluids to compensate and to prevent dehydration.

A summary of recommended work breaks and personal monitoring schedule follows. These values apply to moderate work levels. For heavy work levels, apply monitoring schedule one level up. Light to sedentary work activities can be moved down one level if workers are acclimated and show no signs of heat stress.

For example:

You are performing oversight work in Level D and your task is to record data. It is 75 degrees F and sunny. The adjusted temperature is then 88 degrees F. If you are acclimated to warm weather work, you could work and conduct heat stress monitoring every 90 minutes. If, on the other hand you were shoveling material and were acclimated to warm weather work, you would need to monitor for heat stress every 45 minutes.

Adjusted Temperature* (°F)	Normal Work <u>Clothes</u>	Impermeable Work <u>Clothes</u>
above 90	45	15
88 to 90	60	30
83 to 87	90	60
77 to 82	120	90
72 to 78	150	120

* Adjusted temperature = measured temperature + (13 x % sunshine)

NOTE

These recommendations and guidelines are adapted from *Threshold Limit Values and Biological Exposure Indices for 1990-1991*, published by the American Conference of Governmental Industrial Hygienists, Cincinnati, OH.

Signs and Symptoms

- Heat rash
- Heat cramps: Muscle spasms; pain in hands, feet or abdomen
- Heat exhaustion: Pale, cool moist skin; heavy sweating; dizziness; nausea; fainting
- Heat stroke: Red, hot, usually dry skin; lack of, or reduced, perspiration; nausea; dizziness; confusion; strong, rapid pulse; coma

First Aid

Remove the affected individual's protective clothing and equipment. Wrap the victim in wet towels or clothing. If there are signs or symptoms of heat exhaustion or heat stroke, get medical attention immediately.

D

GENERAL HEALTH AND SAFETY RULES

D

GENERAL HEALTH AND SAFETY RULES

GENERAL HEALTH AND SAFETY RULES

Use proper lifting techniques when handling heavy articles. Keep the load close, bend your knees, never twist or turn with a load. When in doubt, get help or divide the load.

Report to your manager immediately any condition or practice you think might cause injury to employees or others or damage to property, equipment or environment.

Do not participate in horseplay. Do not distract others from their work.

Always wear a safety belt, whether passenger or driver, when in a motor vehicle on company business.

SAFETY RULES FOR FIELD WORK

Wear personal protective equipment in all operations where there is an exposure to hazardous conditions or where the need for using such equipment to reduce the hazards is designated.

Hard hats are required in areas where there is a possible danger of head injury from impact, or from falling or flying objects, or from electrical shock and burns.

Hearing protection is required when exposure to noise is above OSHA allowable levels.

Eye and/or face protection is required when machines or operations present potential physical or health hazards to the eyes or face.

Respiratory protection is required when controls fail or are inadequate to prevent harmful exposure.

Personal flotation devices are required when working over or near water.

Foot protection is required as necessary to prevent injury from dropped or falling objects.

Observe all safety signs and do not remove any "lock-out" tags.

Work not more than 12 hours per day, exclusive of travel time, when operating machines and equipment.

Wear radiation badge when working with nuclear testing equipment.

Follow procedures outlined in Troxler Manual when using, transporting or storing nuclear density meter.

Secure all loose equipment in the test vehicle which might "fly" when making sudden stops.

Use proper lifting techniques when transporting nuclear meters or other heavy articles.

Stay away from the swing of the back-hoe bucket. Approach only when things are secure.

Read the Site Safety Plan before field mobilization. Comply with its requirements at all times.

Always use ground-fault interrupt in all circuits that might be exposed to moisture or are used outside.

Use only grounded or double insulated power tools.

Notify the SSO of any unsafe acts or conditions.

Site personnel are to notify the SSO at the first indication that they are experiencing temperature stress or any signs or symptoms which may be due to exposure of chemicals.

Site Personnel are expected to comply with applicable OSHA, EPA or other regulatory agency standards and regulations at all times.

SAFETY RULES FOR WORK IN OR NEAR MANHOLES, TRENCHES, AND EXCAVATIONS

Field personnel are not to enter confined spaces such as pits, trenches, tanks or manholes, unless confined space entry procedures are specifically included in the Site Safety Plan (SSP) and are fully implemented.

Most work can be performed without entering trenches or excavations. Make the necessary engineering changes to accomplish the task without entering the trench or excavation. For example, soil samples can be taken from the backhoe bucket eliminating the need for anyone to enter the excavation.

If such changes can not be implemented, the Site Safety Plan must be amended to include confined space entry procedures. Enter only if the excavation is constructed according to OSHA standards and the Site Safety Plan specifically addressed entry into excavations:

Excavations are to be filled in or barricaded at the end of the workday.

Do not enter manholes or other similar devices:

- Where noxious gases are present
- Without a co-worker at topside
- Where rungs are unsafe
- That contain electrical cable and equipment

SAFETY RULES WHEN WORKING NEAR HIGHWAYS OR CONSTRUCTION SITE TRAFFIC

Set out traffic cones, warning signs, and flashers when performing field work in traffic areas. In traffic areas and on construction sites where heavy equipment is operating, wear luminous traffic vests.

Use safety signs when performing bridge and highway surveys and use warning lights on vehicles, as appropriate.

Let the construction equipment operators know you are around. Have "eye to eye" contact prior to setting up for a test.

Check the traffic pattern on construction projects before entering with a Warzyn vehicle.

If practical, use your vehicle on a large site to divert construction traffic around the test area.

Park the testing vehicle between your work area and the operating equipment. Always work a significant distance behind your vehicle to allow for it being struck.

SAFETY RULES FOR HAZARDOUS WASTE SITES

Smoking is not permitted at the site or in the site trailer.

Eating and drinking are only permitted in the support or clean zone.

No open fires are allowed.

All employees handling hazardous waste samples or who may be exposed to hazardous or solid waste must be active participants in the medical surveillance program.

A respirator can not be worn when beards or any other facial hair interferes with the face-to-respirator seal. Individuals with such facial hair are not to be allowed to work in Level of Protection C or B.

Working alone on field sites is generally prohibited. The "buddy system" is to be enforced at all times unless the Health and Safety Coordinator (HSC) specifically exempts the work from his requirement, based on the HSC's review of site conditions and hazards. When working under the "buddy system", personnel are to:

- Never work alone
- Provide partner with assistance
- Observe partner for signs for overexposure/temperature stress
- Check integrity of partner's protection clothing
- Notify others if emergency help is needed

Personnel on site must use the buddy system when wearing respiratory protective equipment. Visual contact must be maintained between pairs on-site. Entry team members are to remain close together to assist each other during emergencies.

No "souvenirs" or samples not required for the project are to be collected.

Samples are to be placed in approved containers before they can be removed from the site. Only approved or designated vehicles can be used to transport samples.

Samples are to be left in the staging area. Samples are never to be brought into the office.

Field apparel that had not been decontaminated is not to be worn into the office.

Field samples are to be disposed properly.

Contact with contaminated or suspected contaminated surfaces is to be avoided.

Do not walk through puddles, discolored surface, **kneel on the ground**, or lean, sit, or place equipment on visibly stained surfaces.

Drums or tanks found on site are not to be opened or moved unless specific drum/tank remediation tasks are specifically included in the SSP and are fully implemented.

Use work schedules that minimize time spent in hazardous areas.

Use work assignments that place employees upwind of sources of air contaminants.

Post the Site Safety Plan, or have a copy readily available, for review by employees. Verify that all personnel have read and signed the SSP.

Complete the "Comprehensive Site Health and Safety Checklist":

- Prior to the start of any site activities
- At the start of any new phase of work
- When site conditions change

Complete the "Daily Health and Safety Checklist" prior to the start of each day's activities.

E

DECONTAMINATION

E

DECONTAMINATION

Everything leaving the exclusion zone must be decontaminated or properly discarded. The exclusion zone is to be defined in the Site Health and Safety plan. All personnel entering the exclusion zone must exit through the decontamination zone. All equipment is to be decontaminated and inspected before it is moved into the support zone. Decontamination solutions are to be appropriate for the hazards. Decontamination solutions are to be changed at least daily and stored on site until disposal arrangements are made. **Any material generated by the decontamination procedures will be stored in a designated area in the exclusion zone until disposal arrangements are made. Decontamination rinsate collection will include personal decontamination and decontamination pad waters. These waters will be temporarily stored in 55-gallon drums prior to the proper disposal of the waters in the leachate collection system.**

Note: WRL personnel to recommend initial location of the personnel and equipment decontamination areas.

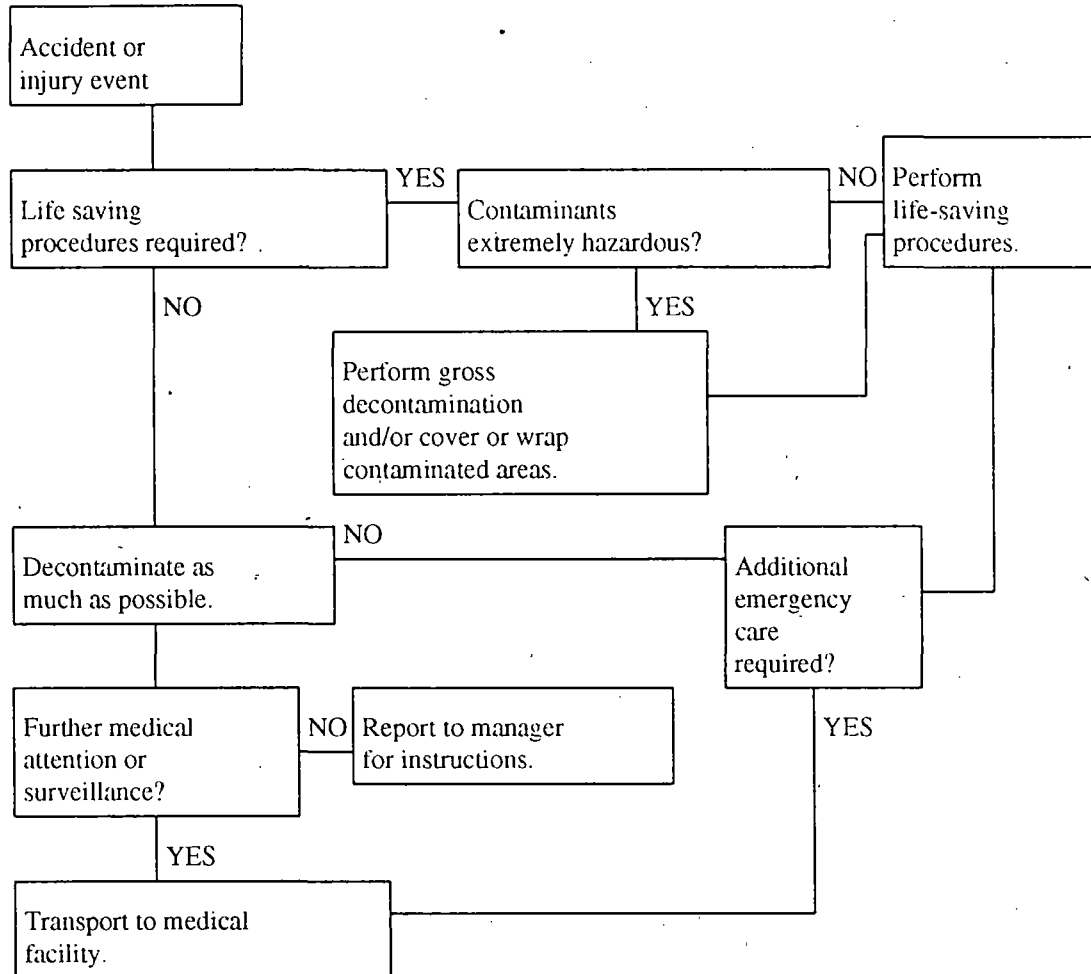
EMERGENCY DECONTAMINATION

The need for emergency decontamination of an individual may arise as the result of:

- Injury or illness
- Overexposure to chemicals or hazardous substances
- Temperature stress

Primary consideration needs to be given to life-preservation actions and the minimization of additional harm or health risks to the individual in the emergency situation and the rescuing individuals.

EMERGENCY DECISIONS



LEVEL B ROUTINE DECONTAMINATION

Equipment Drop

Deposit equipment used on site (tools, sampling devices, monitoring equipment, radios, etc.) on plastic drop cloths. Decontaminate or dispose of items before removal from exclusion zone.

Outer Boot/Glove Wash and Rinse

Scrub outer boots/gloves with decontamination solution then rinse with water.

Outer Boot/Glove Removal

Remove outer boots/gloves:

- If outer boots/gloves are disposable, deposit them in the appropriate plastic-lined container.
- If outer boots/gloves are not disposable, store them in a clean, dry place.

Outer Garment Removal

If using self-contained breathing apparatus (SCBA), remove SCBA back pack and remain on air as long as possible. Remove chemical-protective outer garments and deposit in the appropriate container.

Respiratory Protection Removal

Remove hard hat and face piece, and deposit on a clean surface. Wash and rinse hard hat and face piece. Wipe off and store face piece in a clean, dry location.

Inner Glove Removal

Remove inner gloves and deposit in the appropriate container for disposal.

Field Wash

Thoroughly wash hands and face with soap and water. Shower as soon as possible.

LEVEL B DECONTAMINATION FOR AIR TANK EXCHANGE**Equipment Drop**

Deposit equipment used on site (tools, sampling devices, monitoring equipment, radios, etc.) on plastic drop cloths. Decontaminate or dispose of items before removal from exclusion zone.

Outer Boot/Glove Wash and Rinse

Scrub outer boots/gloves with decontamination solution then rinse using water.

Outer Boot/Glove Removal

Remove outer boots/gloves:

- If outer boots/gloves are disposable, deposit them in the appropriate plastic-lined container.
- If outer boots/gloves not disposable, store them in a clean, dry place.

Tank Change

Exchange air tank. Don new outer boots/gloves. Tape joints and return to exclusion zone.

LEVEL C ROUTINE DECONTAMINATION**Equipment Drop**

Deposit equipment used on site (tools, sampling devices, monitoring equipment, radios, etc.) on plastic drop cloths. Decontaminate or dispose of items before removal from exclusion zone.

Outer Boot/Glove Wash and Rinse

Scrub outer boots/gloves and/or splash suit with decontamination solution then rinse with water.

Outer Boot/Glove Removal

Remove outer boots/gloves:

- If outer boots/gloves are disposable, deposit in them in the appropriate plastic-lined container.
- If outer boots/gloves are not disposable, store them in a clean, dry place.

Outer Garment Removal

Remove chemical-protective outer garments and deposit them in the appropriate container.

Respiratory Protection Removal

Remove hard hat and respirator and deposit them on a clean surface. Discard respirator cartridges in the appropriate container. Wash and rinse hard hat and respirator. Wipe off and store respirator in a clean, dry location.

Inner Glove Removal

Remove inner gloves and deposit in them in the appropriate container for disposal.

Field Wash

Thoroughly wash hands and face with soap and water. Shower as soon as possible.

LEVEL C DECONTAMINATION FOR RESPIRATOR-CARTRIDGE EXCHANGE

Equipment Drop

Deposit equipment used on site (tools, sampling devices, monitoring equipment, radios, etc.) on plastic drop cloths. Decontaminate or dispose of items before removal from exclusion zone.

Outer Boot/Glove Wash and Rinse

Scrub outer boots/gloves and/or splash suit with decontamination solution then rinse with water.

Outer Boot/Glove Removal

Remove outer boots/gloves:

- If outer boots/gloves are disposable, deposit in them in the appropriate plastic-lined container.
- If outer boots/gloves are not disposable, store them in a clean, dry place.

Respirator Cartridge Change

Exchange respirator cartridges. Don new outer boots/gloves. Tape joints and return to exclusion zone.

LEVEL D-MODIFIED ROUTINE DECONTAMINATION

Equipment Drop

Deposit equipment used on site (tools, sampling devices, monitoring equipment, radios, etc.) on plastic drop cloths. Decontaminate or dispose of items before removal from exclusion zone.

Outer Boot/Glove Wash and Rinse

(Optional, include if necessary for gross decontamination)

Scrub outer boots/gloves and/or splash suit with decontamination solution then rinse with water.

Outer Boot/Glove Removal

Remove outer boots/gloves:

- If outer boots/gloves are disposable, deposit them in the appropriate plastic-lined container.

- If outer boots/gloves are not disposable, store them in a clean, dry place.

Outer Garment Removal

Remove chemical protective outer garments and deposit them in an appropriate container. Remove hard hat and safety glasses. Decontaminate them as necessary and deposit on a clean surface.

Inner Glove Removal

Remove inner gloves and deposit them in the appropriate container for disposal.

Field Wash

Thoroughly wash hands and face with soap and water. Shower as soon as possible.

F

FIELD EMERGENCY
RESPONSE PROCEDURES

F

FIELD EMERGENCY RESPONSE PROCEDURES

Based on the type of potential hazards that may be present, the Site Safety Officer (SSO) is to determine if a site specific emergency response plan is necessary prior to the beginning of work. If a site specific plan is necessary, it is to be attached to the Site Safety Plan (SSP).

FIRES AND EXPLOSIONS

Even a minor fire can become a serious problem, particularly when adjacent to flammable or combustible materials. The first few minutes after discovery of a fire are the most critical in preventing a larger emergency.

In case of a fire or explosion, immediately turn off burners and other heating devices and stop any work in progress. Give priority to assisting injured persons.

Small Fires

Take the following actions immediately:

- Alert other personnel in the vicinity and send someone for assistance
- If it is a small fire - one that can be extinguished within 30 seconds or with one fire extinguisher - attempt to extinguish the blaze if:
 - Conditions are safe
 - You have the proper type of fire extinguisher
 - You have been trained to use a fire extinguisher properly

- You are not alone

The combination (ABC) extinguishers in the Warzyn Emergency Kits can be used against the following classes of fires:

- Class A fires - ordinary combustible solids such as paper, wood, coal, rubber and textiles
- Class B fires - petroleum hydrocarbons (diesel fuel, motor oil and grease) and volatile flammable solvents
- Class C fires - electrical equipment

These extinguishers, however, are not effective against Class D fires which include combustible or reactive metals (such as sodium and potassium), metal hydrides or organometallics. Special Class D extinguishers are required.

Avoid entrapment by a fire; always fight from a position accessible to an exit.

If there is any chance that the fire can not be controlled by locally available personnel and equipment, the following action should then be taken:

- Activate the emergency alarm system (if available) and notify the local fire department.
- Confine the emergency to prevent further spread of the fire.
- Assist injured personnel and provide first aid or transportation to medical aid, if necessary.

Next notify client if the client is in close proximity to the fire. (If not, notify the fire department). Assess the need with the client to contact the fire department. If the fire department is contacted, be prepared to tell them:

- Who you are
- Your location
- Type of fire (i.e., electrical, chemical, combustible solids, vapor)
- If the fire is extinguished
- The need for medical assistance

- Other potential hazards in the area (i.e., proximity to bulk tanks, downed electrical lines, poor access)
- What you will be doing after you hang up the phone and where they can find you or reach you

Upon arrival of the local fire department, brief them of the incident. When given permission, contact the Project Manager (PM) or in the PM's absence, the Office Supervisor or Corporate Health and Safety Manager.

Large Fire or Explosion

If other people are in the area, immediately notify them and then call the local fire department. Be prepared to tell them:

- Who you are
- Your location
- Type of fire (i.e., electrical, chemical, combustible solids, vapor)
- If the fire is extinguished
- The need for medical assistance
- Other potential hazards in the area (i.e., proximity to bulk tanks, downed electrical lines, poor access)
- What you will be doing after you hang up the phone and where they can find you or reach you

Upon arrival of the fire department, turn over command to them and supply as much information as possible. When given permission, contact the PM or in the PM's absence, the Office Supervisor or Corporate Health and Safety Manager. Get a number where they can again be reached.

FLAMMABLE/COMBUSTIBLE LIQUID SPILLS

If a spill of a flammable or combustible liquid occurs, all possible sources of ignition should be extinguished or removed immediately.

Use Material Safety Data Sheets (MSDSs), analytical information from laboratory personnel, and any other available sources of information, together with your own

expertise to determine if spill control and clean up can be safely accomplished with the personnel and materials on site.

The following general spill clean up procedures can be utilized, but more specific techniques might be required for certain chemicals.

- Vermiculite or other suitable absorbent may be used to solidify free liquids.
- Both spilled liquids and solids-residues must be contained in drums.
- If a spill occurs on soil, it must be scraped and contained.

EVACUATION

Prior to beginning work, the SSO should brief all Warzyn and subcontractor employees on what the evacuation signal should be. It may be nothing more than a verbal command or it may be some audible alarm such as a bell or horn. If working at a client's site, familiarize yourself with their warning system.

Prior to work, the SSO should determine a meeting place if evacuation is necessary. Preferably the meeting place should be upwind of the work activities and at a safe distance. All Warzyn and subcontractor employees should be informed of the meeting location.

If evacuation is necessary, everyone should go directly to the meeting area. The SSO should ensure all personnel (Warzyn and subcontractor) are accounted for. This will mean checking the sign-off documentation on the Site Safety Plan or on larger jobs the daily sign-in roster. The local on-scene commander should immediately be notified of any missing personnel as well as their last known whereabouts.

Site Evacuation

If an evacuation of the site is necessary, certain rules must be strictly followed:

- Employees in the vicinity should immediately shut down all equipment and disconnect electrical or flammable power sources to machinery.
- Immediately after personnel are alerted, they will evacuate the facility via the nearest escape route.

- All evacuated personnel will assemble at the predetermined meeting place.
- Employees should not wait for friends; the Site Safety Officer will ensure all personnel have evacuated before departing.
- Employees should move quickly and calmly without panic.
- Employees should not smoke.
- Once assembled, employees should remain calm and quiet while the Site Safety Officer takes roll call and assesses the situation. Each employee must report to the Site Safety Officer until everyone is accounted for and evacuation is complete.

Off-Site Evacuation

If an incident is large enough, off-site personnel may also need evacuation. If off-site evacuation is necessary, follow the appropriate local notification procedures, generally through the fire department. Warzyn personnel should not attempt to evacuate off-site personnel but should leave that task to the local authorities. All Warzyn employees should follow the evacuation directions given by the local authorities. The Site Safety Officer should offer to remain at the command post to supply information. If told to leave, the SSO should leave.

Local authorities will have present an on-scene commander. The on-scene commander will direct emergency operations and will have assistance from the local fire department, police department and emergency government.

After evacuating to a safe area, the PM should be contacted or in the PM's absence, the Office Supervisor or Corporate Health and Safety Manager.

DISCUSSION OF INCIDENT

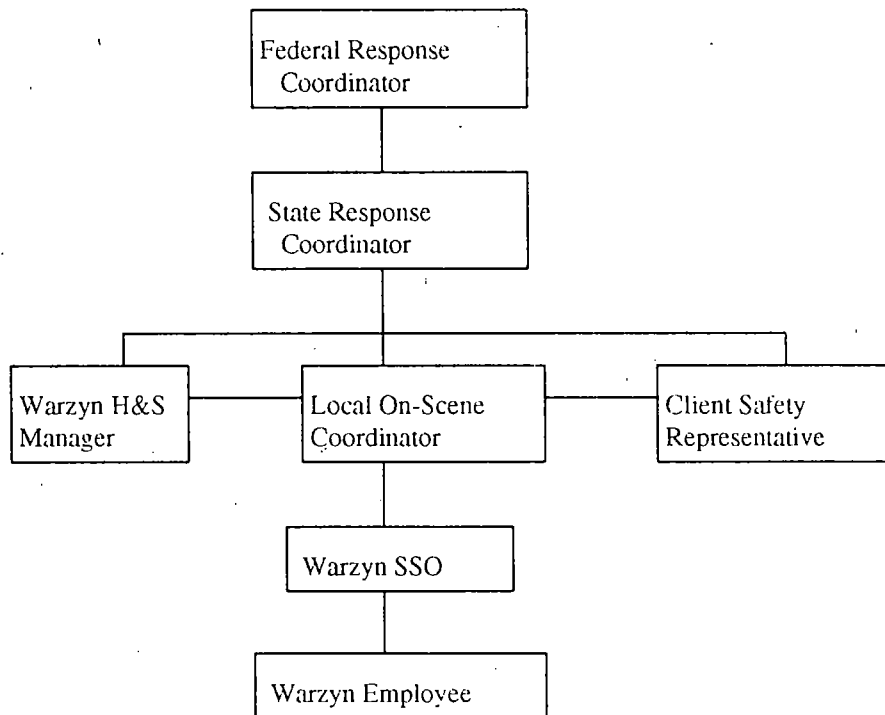
At no time should a Warzyn employee discuss an emergency incident with members of the media. Politely refuse to discuss the situation and instead, direct all inquiries to the Corporate Health and Safety Manager. Provide the media people with the office phone number.

However, Warzyn employees should always provide whatever useful information they can to response personnel. Stick to helpful facts and avoid placing blame or judgement. That will be sorted out later. Politely refuse to find fault or place blame.

At a safe place and at the appropriate time, write down all you remember of the incident. How did it happen? Who was doing what? What did I see? What did I hear? All these types of things may be important later when things are sorted out.

CHAIN-OF-COMMAND

The number of people involved in an incident will be directly related to the severity of the incident. In the event of an incident, the chain-of-command could be as extensive as:



Upon arrival of the local on-scene coordinator or client safety representative, the Warzyn SSO should turn over command of the situation. The responsibility of the Warzyn SSO is then to supply information and offer Warzyn supplies and personnel if requested. It is likely the local on-scene coordinator or client safety representative will not request Warzyn personnel but may request Warzyn supplies (HNU, absorbant, drums). In a major incident, it is likely the Warzyn Health and Safety Manager will arrive at the scene. At that time, all responsibilities of the SSO should be turned over to the Health and Safety Manager.

G

FIRST AID

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FIRST AID

GENERAL SEQUENCE FOR TREATMENT OF EXPOSURES TO UNKNOWN CHEMICALS

1. Quickly protect yourself from exposure before attempting to rescue the victim.
2. Decontaminate the victim and terminate exposure.
3. Treat cessation of breathing first.
4. If the heart is not beating, perform cardiopulmonary resuscitation (CPR).
5. Treat eye injuries next.
6. Treat skin contact.
7. Treat shock.
8. Call for help.

PRELIMINARY ASSESSMENT

Make a quick assessment of the likely routes of exposure by examining the eyes, mouth, nose and skin of the victim for signs of the chemical itself or damage it has caused such as swelling, redness, bleeding, burns, discharge of fluid or mucous or pallor.

Drooling, difficult swallowing, a distended and painful or hard, rigid abdomen all indicate possible ingestion of a corrosive or caustic substance.

If respirations are rapid, shallow, noisy or labored, suspect inhalation.

If the face has been splashed with chemical, eye contact is likely.

POISONING BY INHALATION

Remove the victim from exposure while protecting yourself from exposure.

If breathing has stopped, administer artificial resuscitation using a disposable resuscitator and avoid mouth-to-mouth contact. **DO NOT** use mouth-to-mouth resuscitation if the nature of the chemical exposure is unknown.

Maintain an open airway.

Notify an emergency medical service of the nature of the accident and arrange for transport to a medical facility.

POISONING BY INGESTION

Remove the victim from exposure while protecting yourself from exposure.

Call a poison control center, emergency room or physician for advice.

Notify an emergency medical service of the nature of the accident and arrange for transport to a medical facility.

Consult the MSDS to determine whether to offer victim water to drink or to induce vomiting and by what means.

If the victim is conscious:

- Have the victim rinse out mouth with water.
- If there are no signs of burns, swallowing difficulty or abdominal problems and victim is conscious and if so advised by a physician or poison control center:
 - Induce vomiting by giving two teaspoons of Syrup of Ipecac. Follow with at least one cup of water. **DO NOT** use milk. If you do not have Syrup of Ipecac, induce vomiting by asking the

victim to touch the back of the throat with a finger, spoon handle or blunt instrument.

- Have the victim sit up or lean forward while vomiting.
- Save any vomitus and give it to the emergency medical service personnel to take to the medical facility for analysis.
- Give the victim one to two cups of water to drink after vomiting has ceased.
- Keep talking to the victim to prevent sleepiness.

If the victim is unconscious:

- Lay the victim on the victim's left side, bending the victim's right hip.
- Maintain an open airway.
- Arrange for transport to the nearest medical facility.
- Stand by to administer artificial resuscitation and CPR if needed. Be sure to wipe or rinse all traces of chemical from in and around the victim's mouth before giving artificial resuscitation. Always use disposable resuscitators supplied in the Warzyn First Aid kits when performing CPR. **DO NOT** use mouth-to-mouth resuscitation if the nature of the chemical exposure is unknown.
- If breathing has stopped, administer artificial resuscitation using a disposable resuscitator and avoid mouth-to-mouth contact.

If the victim vomits, save the vomitus and send it to the medical facility for analysis.

If the victim shows signs of shock (a weak, rapid pulse; pale clammy skin; cold hands and feet), elevate the victim's feet eight to twelve inches and cover the victim with a blanket.

DO NOT give an unconscious person anything to drink.

DO NOT give someone who is convulsing anything to drink.

POISONING BY SKIN CONTACT

Remove the victim from the contaminated area, being careful to protect your lungs, skin and eyes.

Remove the victim's clothing, shoes and jewelry from the affected areas, cutting them off if necessary. Do this under a shower or while flushing with water.

Continue to flush with water until all trace of the chemical is gone and any slippery feeling has disappeared also. Rinse for at least 15 minutes.

Cover the victim with a blanket or dry clothing.

Notify a physician, emergency room or poison control center of the accident and obtain advice.

In case of inflammation, burns, blisters or pain:

- Loosely apply a dry sterile dressing, if available, or use a clean dry cloth.
- Notify an emergency medical service of the nature of the accident and arrange for transport to a medical facility.
- If the victim is in a state of shock:
 - Lay the victim down on the victim's side and cover the victim with a blanket.
 - Elevate the victim's feet eight to twelve inches.
 - Notify an emergency medical service of the nature of the accident and arrange for transport to a medical facility.

DO NOT break open blisters or remove skin. If clothing is stuck to the skin after flushing with water, do not remove it.

DO NOT rub or apply pressure to the affected area.

DO NOT apply any oily substance to the affected skin.

DO NOT use hot water.

POISONING BY EYE CONTACT

Remove the victim from the contaminated area, being careful to protect your lungs, skin and eyes.

Act quickly. Seconds count. Flush the victim's eye(s) with clean tepid water for at least 15 minutes. Have the victim lie or sit down and tilt head back. Hold eyelid(s) open and pour water slowly over the eyeball(s) starting at the inner corners by the nose and letting the water run out of the outer corners. The victim may be in great pain and want to keep eyes closed or rub them but you must rinse the chemical out of the eye(s) in order to prevent possible permanent damage.

Ask the victim to look up, down and side to side as you rinse.

Call an emergency medical service and arrange for transport to the nearest facility for examination and treatment as soon as possible. Even if there is no pain and vision is good, a physician should examine the eye(s) since delayed damage may occur.

If the eye(s) is(are) painful:

- Cover loosely with gauze or a clean, dry cloth
- Maintain verbal and physical contact with the victim

HYDROGEN CYANIDE EXPOSURE

Hydrogen cyanide is a Class A poison which can cause asphyxiation by ingestion, inhalation, or absorption of liquid or vapor through the skin (particularly eyes, mucous membranes, and feet). Hydrogen cyanide has a bitter almond odor and has a threshold limit value-ceiling-TLV-C of 10 ppm.

The SSO will notify the local medical facility if the potential for hydrogen cyanide exposure exists at the Site. This will allow emergency personnel to have the necessary equipment in the event of a cyanide exposure emergency.

Signs and Symptoms of Exposure

Inhalation

Very acute poisoning

- Victim cries out before losing consciousness
- Victim falls to the ground
- Wheezing

- Foaming at mouth
- Violent convulsions
- Almost immediate death

Acute poisoning

- Excitement phase
 - Headache
 - Breath smells of bitter almond
 - Dizziness
 - Nausea, occasionally vomiting
 - Rapid breathing
 - Anxiety and excitement
- Depression phase
 - Difficulty in breathing
 - Chest pain
 - Drowsiness
- Convulsion phase
 - Convulsions
 - Jaws clenched together
 - Foaming at mouth
 - Loss of consciousness
- Paralysis phase: If the subject survives, there is a risk of permanent nervous system damage.
 - Deep coma
 - Dilated pupils
 - Weak and irregular pulse
 - Breathing stops
 - Death

Slight poisoning

- Headache
- Dizziness
- Anxiety
- Difficulty in breathing

Ingestion

(See symptoms described under Inhalation - Acute to slight poisoning)

Burning tongue and mouth

Salivation

Nausea

Skin contact

The gaseous and liquid compounds are quickly absorbed by the skin and cause symptoms described under INHALATION, resulting in acute to slight poisoning. Depending on their nature, they can be very or only slightly irritating.

Splashing in eyes

Irritation and watering of eyes

When absorbed by mucous membranes of the eyes, these compounds can cause the same symptoms described in INHALATION, resulting in slight poisoning.

First Aid

Inhalation

Remove the victim from the contaminated area only after protecting yourself from exposure.

Have someone call the Emergency Medical Service and arrange for transport to a medical facility. Inform them of the nature of the exposure.

Remove contaminated clothing and equipment while wearing appropriate protective clothing.

If the victim has stopped breathing:

- Open airway, loosen collar and belt. Do not use direct mouth-to-mouth resuscitation for cyanide exposure. A bag-valve mask is required.
- Check the pulse.
- Continue your efforts until help arrives or the victim starts to breathe on their own.
- Keep the victim warm and quiet.

If the victim is unconscious but breathing:

- Lay the victim on their back. If the victim is vomiting, turn the head to the side.
- Clear the airway and loosen tight clothing.
- Keep victim warm and quiet.
- Do not leave the victim unattended.
- Never give an unconscious person anything to drink.

If the victim is conscious:

- Lay the victim down, cover the victim with a blanket and keep them quiet.
- Loosen tight clothing.

Ingestion

Start lifesaving treatment, call for help and, if possible, empty the stomach and prevent further injury caused by absorption. **PROMPT TREATMENT IS LIFESAVING.**

- Ask someone to call a poison control center, inform them of the chemical swallowed and follow their advice.
- Ask someone to call the Emergency Medical Service and arrange for transport to a medical facility.

If the victim is unconscious or unresponsive:

- Lay the victim on the left side and loosen the victim's collar and belt.
- Check the airway for obstruction.

If the victim stops breathing, administer artificial respiration using a bag-valve mask. Do not use direct mouth-to-mouth resuscitation.

If the victim is conscious and alert:

- Remove the victim from the contaminated area to a quiet, well ventilated area.
- Loosen tight clothing around the neck and waist.
- Have the victim rinse mouth several times with cold water and spit out.
- Give him 1 or 2 cups of water or milk to drink.
- Induce vomiting by touching the back of the throat with your finger, a spoon handle or a blunt object.
- Have the victim sit up and lean forward while vomiting.
- Save vomitus for analysis later. Avoid skin contact with it.
- Do not leave the victim alone.

DO NOT give an unconscious person or a person who is having a convulsion anything to drink. **DO NOT** give alcohol, drugs, or stimulants like tea or coffee. **DO NOT** continue to try to induce vomiting in someone who doesn't gag when you touch the back of his throat.

Skin contact

Remove the victim from the source of contamination and take them **IMMEDIATELY** to the nearest shower or source of clean water. Remove clothing, shoes, socks and jewelry from the affected areas as quickly as possible, cutting them off if necessary. Be careful not to get any of the chemical on your skin or clothing. Wash the affected area under tepid running water using a mild soap. Thoroughly rinse the affected area with tepid water. Dry the skin gently with a clean, soft towel. Notify a physician, emergency room, or poison control center and inform them of the nature of the substance and the accident. Arrange for transport to the nearest medical facility. Do not leave the victim alone. Watch for signs of systemic toxicity.

If the skin is inflamed or painful, put the painful part in cold water or apply cold wet dressings on the burned area.

Eye contact

Remove all the chemical from the eye(s) quickly. Remove the victim from the source of contamination and take them to the nearest eye wash, shower, or other

source of clean water. Gently rinse the affected eye(s) with clean, lukewarm water for at least 15 minutes. Have the victim lie or sit down and tilt their head back. Hold the eyelid(s) open and pour water slowly over the eyeball(s) at the inner corners, letting the water run out the outer

corners. Ask the victim to look up, down and side to side as you rinse in order to better reach all parts of the eye(s). Have the victim remove contact lenses if they are wearing them. Arrange for transport to the nearest medical facility for examination and treatment by a physician as soon as possible. Tell the Emergency Medical Service personnel the name of the chemical and the nature of the accident. Even if there is no pain and vision is good, a physician should still examine the eye(s) since delayed damage may occur. If the victim cannot tolerate light, protect the eye(s) with a clean, loosely tied handkerchief or strip of clean, soft cloth or bandage. Be sure to maintain verbal communication and physical contact with the victim.

DO NOT let the victim rub eye(s). **DO NOT** let the victim keep eyes tightly shut. **DO NOT** introduce oil or ointment into the eye(s) without medical advice. **DO NOT** use hot water.

In all instances when performing First Aid procedures personnel should follow guidelines for Bloodborne Pathogens. Use the PPE - gloves, disposable mouth-to-mouth resuscitators, safety goggles and overgarments supplied in Warzyn First Aid kits. Report all First Aid incidents to the Health and Safety Manager immediately.

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[CHI 652 91]

H

RESPIRATORY PROTECTION

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RESPIRATORY PROTECTION PROGRAM

RESPIRATOR SELECTION AND IDENTIFIED HAZARDS/POTENTIAL HAZARDS

Respirator selection is to be made in accordance with this Section of the Health and Safety Manual, the manufacturer's guidelines and the American National Standards Institute (ANSI) Practices for Respiratory Protection Z88.2-1969.

The decision-logic flow chart found in Section 0500 of the Health and Safety Manual contains recommended guidelines for determining the level of respiratory protection for field sites. Obviously not all conditions which might be encountered are included. Questions concerning which level of respiratory protection to select are to be directed to the office Health and Safety Coordinator.

RESPIRATOR LIMITATIONS

Air-Purifying Respirators

In order to use an air-purifying respirator, the following conditions must be met:

- Oxygen level must be between 19.5 % and 23.5 %.
- Atmospheric contaminants must have good warning properties:
 - Can be recognized by taste or smell
 - Odor/taste threshold must be well below permissible exposure limit (PEL) and threshold limit value (TLV)
- Contaminant is not shock-sensitive or water-reactive.
- A chemical cartridge must be available and approved for use with the known contaminants.

- Air-contaminant level does not exceed the maximum-use concentration (MUC) set by the cartridge manufacturer. While the MUC is specific for each cartridge and is dependent on the type and amount of absorbant, the following MUCs are generally true:
 - 1,000 ppm for organic-vapor cartridges
 - 20,000 ppm for organic-vapor canisters
 - 50 ppm for hydrogen chloride (acid gas) cartridge
 - 50 ppm for sulfur dioxide (acid gas) cartridge
 - 10 ppm for chlorine (acid gas) cartridge

A partial list of gaseous materials for which air-purifying (chemical cartridge) respirators should NOT be used for respiratory protection regardless of concentrations or time of exposures follows. Should concentrations of any of these contaminants be expected to exceed one-half of the TLV, use of an air-supplied respirator would generally be indicated.

Acrolein	Hydrogen selenide	Nitroglycerin
Aniline	Hydrogen sulfide	Nitromethane
Arsine	Methanol	Ozone
Bromine	Methyl bromide	Phosgene
Carbon monoxide	Methyl chloride	Phosphine
Di-isocyanates	Methylene chloride	Phosphorous trichloride
Dimethyl aniline	Nickel carbonyl	Stibine
Dimethyl sulfate	Nitro compounds:	Sulfur chloride
Hydrogen cyanide	-Nitrobenzene	Vinyl chloride
Hydrogen fluoride	-Nitrogen oxides	

Chemical cartridges are to be changed at least at the end of each work shift in addition to whenever breathing becomes difficult or breakthrough (e.g., you can taste or smell the contaminant) occurs.

The primary means of identifying chemical cartridges is the wording of the labels. The secondary means of identification is color coding. The following color coding is used:

- Acid gases: white
- Hydrocyanic acid gas: white with 1/2-inch green stripe completely around the cartridge near the bottom
- Chlorine gas: white with 1/2-inch yellow stripe completely around the cartridge near the bottom
- Organic vapors: black
- Ammonia gas: green
- Carbon dioxide: blue

- Acid gases and organic vapors: yellow
- Hydrocyanic acid gas and chloropicrin vapor: yellow with 1/2-inch blue stripe completely around the cartridge near the bottom
- Acid gases, organic vapors, and ammonia vapors: brown
- Radioactive materials, except tritium and noble gases: purple (magenta)
- Particulates (dust, fumes, mists, fogs or smokes) in combination with any of the above gases or vapors: cartridge color for the contaminant as designated above with 1/2-inch gray stripe completely around the cartridge near the top
- All of the above atmospheric contaminants: red with 1/2-inch gray stripe completely around the cartridge near the top

Air-Supplied Respirators

Air-line respirators and self-contained breathing apparatus (SCBA) are two types of air-supplied respirators (ASR). The breathing air is supplied from either a compressor or a compressed gas cylinder. Supplied-air quality is discussed in separate section which details breathing-air specifications.

Such units are to be operated in the pressure-demand/positive-pressure mode which maintains a slight positive pressure within the facepiece even if a facepiece leak occurs. This prevents contaminants from entering the facepiece.

If an air-line respirator is used in an atmosphere where the level of contaminants is immediately dangerous to life or health (IDLH), an escape bottle with at least a five-minute air supply is to be used with it. An SCBA is to have an alarm that sounds when there is a five-minute supply of air remaining in the tank.

Breathing-air hoses should be kept to less than 200 feet in length for ease of use and breathing; 300 feet lengths are the maximum allowed. Breathing-air hoses are to be dedicated and marked "For Respirator Use Only"; they are not to be used for other applications. The diameter is set by the manufacturer and this size must be used for proper air flow and respirator operation. The respirator manufacturer's hoses must be used to ensure proper operation, maintenance of NIOSH certification and maintenance of respirator manufacturer's product liability.

Air hoses are to be kept off the ground whenever possible and protected from chemical contamination. Do not lay or drag fittings on the ground. Protect air hoses from damage, entanglement, or snagging by heavy equipment, moving machinery, and sharp objects.

RESPIRATOR CARE

Storage

Respirators, when not in use, are to be stored in a clean, dry location, out of direct sunlight. They are to be stored in such a manner that the facepiece, seal, and exhalation valves are not distorted during storage. Do not place objects on top of the respirator during storage.

Inspection

The following inspection points are to be checked prior to donning the respirator and after each use. Under no circumstances should a respirator which fails this inspection be worn. It is to be repaired or replaced.

- Check to see that the headbands still have their elasticity. Inspect for cracks or tears and make sure that all buckles are in place and working properly.
- Check the facepiece for dirt, cracks, tears, or holes. Inspect the shape of the facepiece for distortion that can occur from improper storage and make sure that the face seal is flexible, not stiff.
- Check the inhalation and exhalation valves for cracks, tears, distortions, dirt, build-up of material between the valve and valve seat, and signs of deterioration or degradation.
- For APRs, check the cartridge holders to be sure the gaskets are in place. Check the threads for damage and cracks.
- For APRs, be sure the cartridges and filters are clean. Never try to clean a cartridge or filter by washing it or using compressed air. Inspect the cartridge for dents, scratches or other damage that may effect the seal.
- For ASRs, check the backpack and harness assemblies for damage, worn parts, and proper function. Check the air line and fittings for signs of damage and proper seal.
- For SCBAs, check the cylinder and cylinder valve assembly, regulator, low-air alarm, and high-pressure valve for damage and proper function. Check the breathing tube for cracks, signs of damage, and good seals.

Cleaning

Contaminated respirators are to be cleaned in accordance with the Decontamination SOP first, then regular cleaning is to be completed.

- Break down respirator into its component parts.
- For APRs, discard expended filters and cartridges.

- Discard head straps and valves if they are too contaminated to be cleaned, no longer functional or damaged.
- Wash all remaining parts in warm water and mild detergent. Scrub parts with a soft brush.
- Rinse all parts in clean, warm (120 °F) water.
- Let respirator and its parts air dry in a clean area.
- Inspect all parts and replace if needed. Assemble respirator.
- Wipe all portions of the respirator with antiseptic solution or wipes.
- For APRs, replace used and expended cartridges with the proper new ones.
- Place respirator in plastic bag, seal and store in designated area.

Maintenance

Respirators are to be kept in good condition to function properly. When any part shows evidence of excessive wear or failure, it is to be replaced immediately with the proper part from the manufacturer. Parts from different makes and models of respirators are not interchangeable.

SUPPLIED AIR QUALITY

When conditions require the use of ASRs, the minimum quality level which can be used is Grade-D breathing air. The specifications for Grade-D breathing air are described in Compressed Gas Association Commodity Specification G-7.1-1966 and are summarized below:

- Hydrocarbons, as methane, ≤ 5 ppm
- Carbon monoxide ≤ 20 ppm
- Carbon dioxide $\leq 1,000$ ppm
- No odor
- Oxygen level = 20.9 % if recompressed air, 19.5 % to 23.5 % if reconstituted air

Compressed oxygen, liquid air or liquid oxygen are not to be used.

Breathing air may be supplied to respirators by compressed-gas cylinders or air compressors.

Compressors that are used to supply breathing air are to be equipped with necessary safety and standby devices. Only breathing-air-type compressors are to be used. Compressors are to be constructed and located so as to avoid the entry of contaminated air into the system (e.g., do not place compressor near operating equipment with combustion engines.). Suitable in-line air-purifying absorbant beds and filters are to be installed to further ensure breathing-air quality. Alarms to indicate compressor failure or over-heating are to be installed.

A compressor is to be used in conjunction with a secondary air receiver, such as an escape cylinder worn by the individual, of sufficient capacity to allow the wearer to escape from the contaminated atmosphere in the event of compressor failure. Compressors can utilize vortex coolers if sufficient air quality and pressure is available (15 to 20 cfm at 70 to 80 psig).

If an oil-lubricated compressor is used, it is to have a high-temperature alarm and a carbon monoxide alarm.

Couplings specific for air lines are to be used. Such couplings are to be incompatible with outlets for other gas systems to prevent unintentional connection to non-respirable gases or oxygen.

USE OF RESPIRATORS

Leave the area, follow decontamination procedures, and see your supervisor if any of the following occur:

- Respirator becomes dislodged.
- An odor, taste, or respiratory or throat irritation occurs.
- Air from respirator gets very warm.

When using self-contained breathing apparatus (SCBA) or when there is the possibility of an oxygen-deficient (<19.5%) atmosphere or toxic contaminants of a level that are immediately dangerous to life or health (IDLH), in addition to the employees performing the task, there is to be an attendant. This attendant is to maintain communications - visual, audio, or signal line - with all employees working in the Exclusion Zone. The attendant is to remain outside the Exclusion Zone, in a area where it is unlikely that the attendant will be effected by an incident in the Exclusion Zone. The attendant is to have immediately available the necessary rescue equipment to assist the other employees in case of an emergency. Such rescue equipment is not limited to respiratory protection but may include such items as safety lines, harnesses, hoists, and radio communications.

Employees wearing ASRs are to also wear safety harnesses and safety lines to aid in lifting or removing them from hazardous atmospheres.

An employee is not to be allowed to wear a respirator if any conditions exist which prevent a good face seal. Such conditions include beard, sideburns, or other facial hair that projects under the facepiece, and temple pieces on glasses. The absence of one or both dentures may also adversely affect the facepiece seal.

Each employee who might be expected to wear a respirator in the course of performing assigned work tasks is to be qualitatively fit tested at least annually using at least two different test atmospheres. Generally isoamyl acetate (banana oil) and irritant smoke are used. Employees are to check the fit of their facepiece, using the positive- and negative-pressure tests, each time they don the respirator and also prior to entering a contaminated atmosphere.

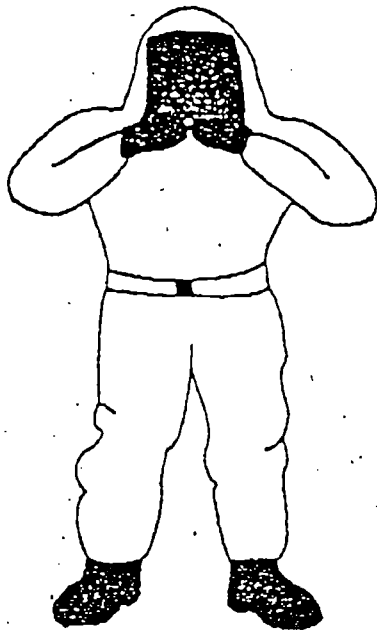
Those employees wearing corrective lenses are to not wear any style which interferes with the face-to-facepiece seal of the respirator. Examples of appropriate corrective lenses to wear with respirators include glasses with the side-temple pieces removed and optical inserts specifically made for the respirator. Should an employee require optical inserts, such inserts will be supplied by Warzyn.

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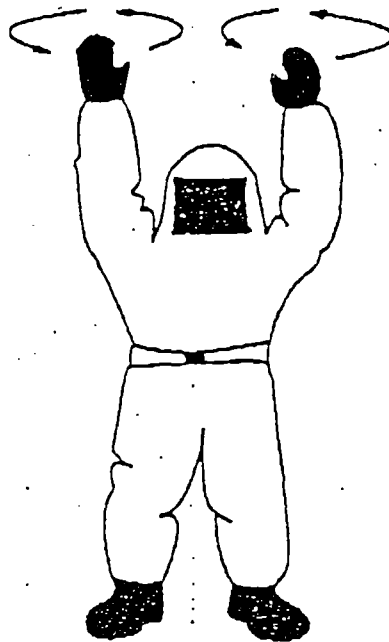
I

WRL CHART OF HAND SIGNALS

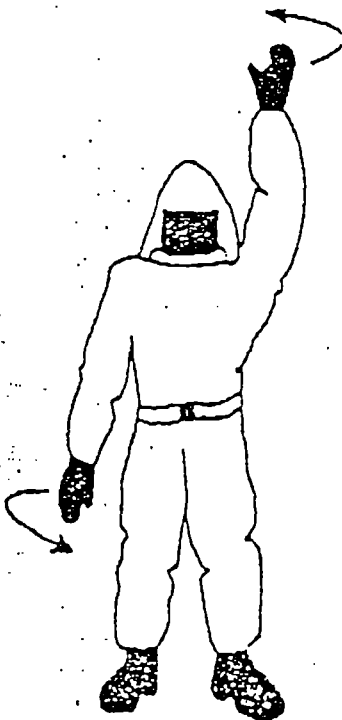
INTERNATIONAL HAND AND ARM SIGNALS



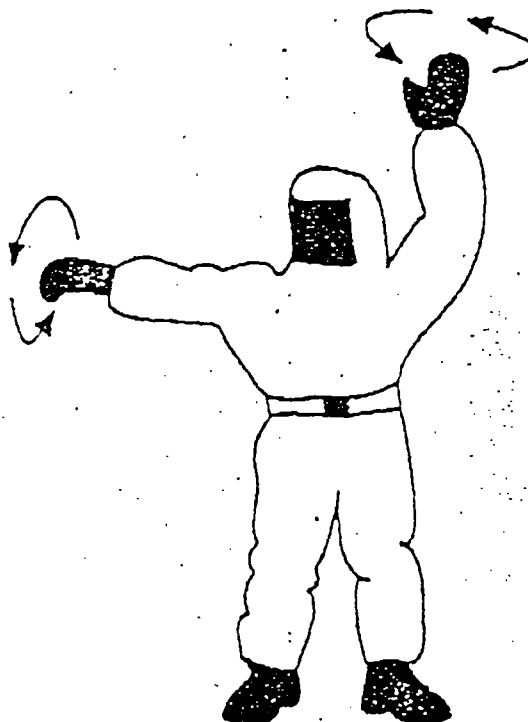
1. OUT OF AIR,
CANNOT BREATHE



2. NEED ASSISTANCE
(HELP GETTING OUT)

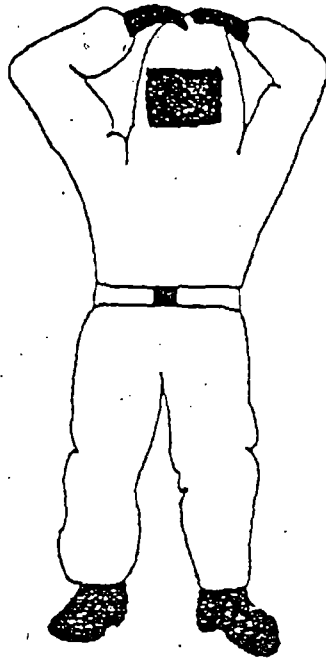


3. BODY RECOVERY

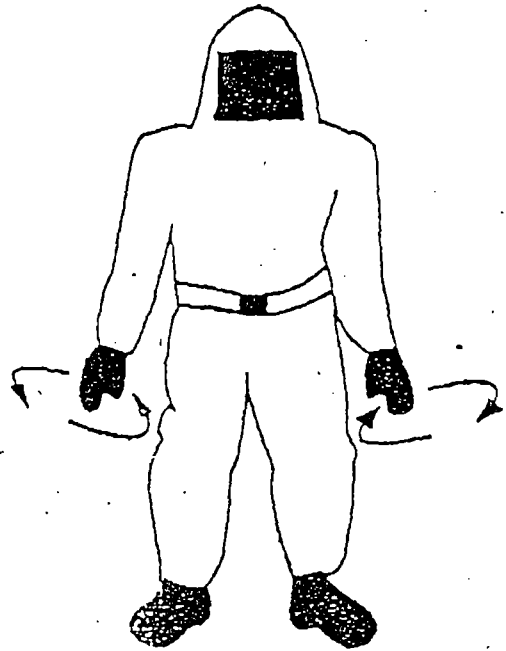


4. ADDITIONAL PERSONNEL
TO HELP WITH REPAIRS

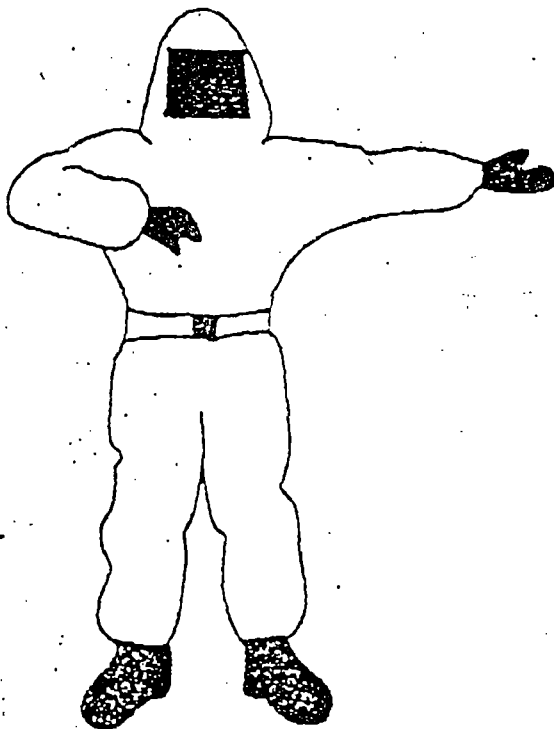
INTERNATIONAL HAND AND ARM SIGNALS



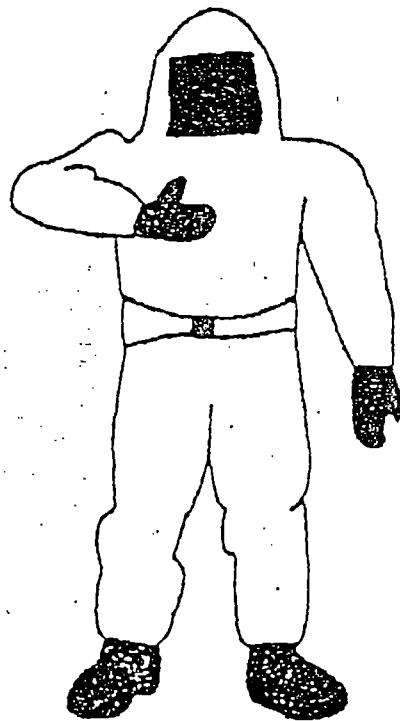
5. RETURNING TO
COMMAND STATION



6. SITUATION GRAVE,
EVACUATE IMMEDIATELY

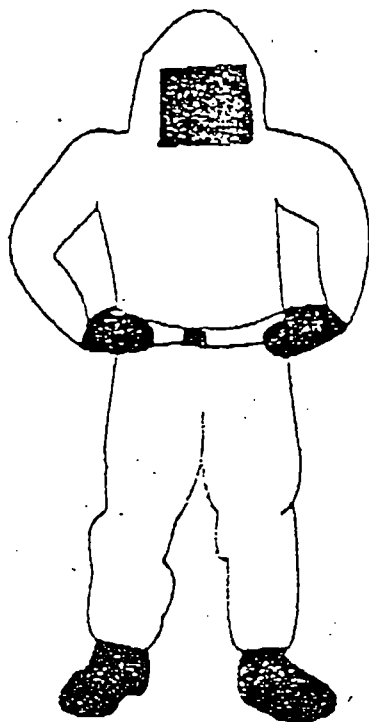


7. ACTIVITIES CANNOT BE COMPLETED
WITH REMAINING AIR SUPPLY

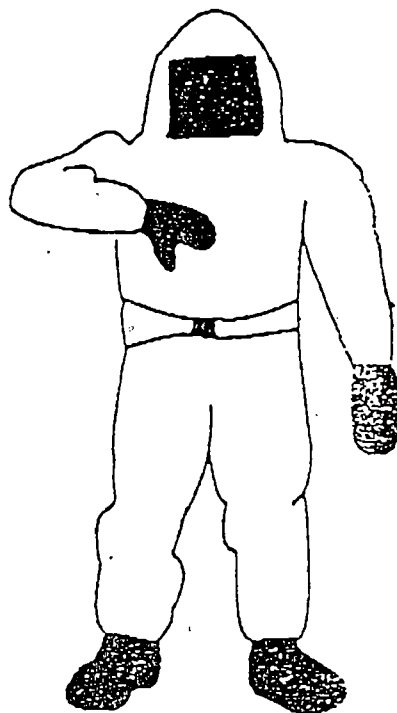


8. OK, I'M ALL RIGHT
or I UNDERSTAND

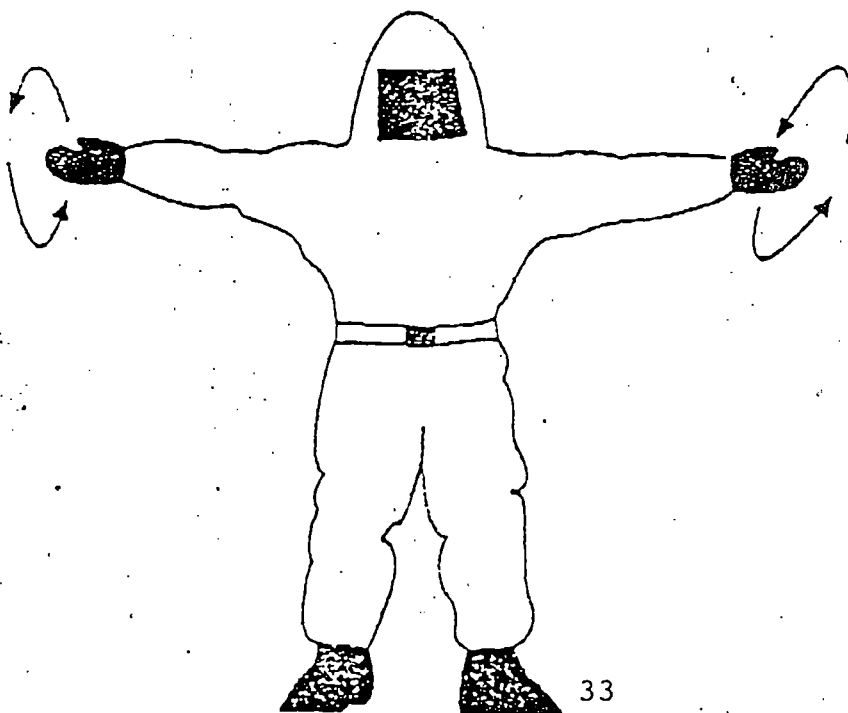
INTERNATIONAL HAND AND ARM SIGNALS



9. LEAVE AREA
IMEDIATELY NO DEBATE



10. NO, NEGATIVE



11. SITUATION
UNDER CONTROL

J

WRL CALIBRATION SCHEDULE AND PROCEDURE FOR AIR MONITORING EQUIPMENT

ROUTINE MAINTENANCE FOR MINIGAS/MULTIGAS MONITOR

CAUTION: The MiniGas must be serviced by qualified personnel only.

GENERAL

Routine Maintenance consists of Preventive Maintenance and Corrective Maintenance (or Repair).

Preventive Maintenance

Essentially, this comprises those actions that need to be carried out (possibly at prescribed intervals) to ensure the continuing correct operation of the instrument. In the case of MiniGas, these actions are as follows:

- (1) Ensure that the exterior is clean, dry and free of corrosive contaminants after use.
- (2) Replace or recharge the battery pack. NiCad battery packs should be recharged after use of the instrument. The four cells in the dry cell battery pack should be renewed before use of the instrument if there is any reason to suspect that they will have insufficient life for the coming period of use.
- (3) Renew the sensor grill filter when necessary. The life of the filter is dependent on the amount of dust in the atmosphere.
- (4) Recalibrate at 6-month intervals or after repair.

Changing and recharging batteries, and renewing sensor grill filters are covered in the user manual. Calibration requires special test equipment and specialist personnel, and is also covered in the user manual.

Corrective Maintenance

For the MiniGas user, this is limited to replacing an exhausted oxygen sensor. The MiniGas has a built in fault detection system which shows if there are any faults with the sensors. Also, if the instrument fails to calibrate correctly or if the zeros are drifting, a sensor may need changing.

New sensors are obtainable from Neotronics or any of their distributors, and instructions for replacing the oxygen sensor can be found in the user manual.

NOTE: If there is any doubt as to the fault, then the instrument must be returned to neotronics or their distributor for servicing.

CALIBRATION

CAUTION: The MiniGas must be calibrated by authorized competent technicians using the correct equipment. If in doubt or if the correct equipment is not available, then the instrument must be returned to Neotronics or any of their distributors for calibration.

The MiniGas should be calibrated at least every 6 months or after repair. Calibration procedures are covered in Chapter 5 of the user manual.

ROUTINE MAINTENANCE FOR ORGANIC VAPOR METER (OVM) MODEL 580B

The routine maintenance of the 580B involves the calibration of the instrument, the cleaning of the lamp window, and maintaining the charge of the battery. The following pages give instructions for routine maintenance. Figure 1 illustrates the detector assembly.

LAMP INSERTION AND REMOVAL

NOTE: The 580B must be off while removing the lamp.

In order to remove the lamp, the four screws which hold the case top and bottom together must first be loosened. The case bottom should be placed flat on the table, and the case top should be placed on its side next to the bottom.

The high voltage power supply is removed next by loosening the thumb screws on each side and then pulling the power supply towards the rear of the instrument (see Figure 1). The lamp may now be removed by loosening the lamp nut.

Insertion of the lamp is accomplished by performing the above tasks in the reverse order. The lamp should be placed flat against the o-ring and the lamp nut fastened down in order to create a proper seal. The high voltage power supply should then be inserted and the thumb screws fastened down. There are three pins protruding from the high voltage power supply which should fit snugly into connectors located beneath the detector. The lamp spring (mounted in the center of the high voltage power supply) should make contact with the lamp ring.

LAMP CLEANING

On occasion the lamp should be removed for cleaning. Cleaning of the lamp is accomplished by cleaning the lens surface of the UV lamp. This is accomplished by using the aluminum oxide scouring powder provided with the 580B.

The procedure for cleaning the lamp is as follows. First place a small amount of aluminum oxide scouring powder on the lens of the UV lamp. Next gently scour this lens with a soft tissue or cloth. Scour

the lens in a rotary type motion. After scouring the lens surface, gently blow the remaining powder from the lens. Thoroughly wipe the lamp lens with a clean tissue to remove the last traces of cleaning powder. The lamp is now able to be inserted into the detector.

CALIBRATION

NOTE: Chapter four of the user manual should be read before calibrating the 580B in order to gain a better understanding of the concepts behind calibration of the 580B.

The following is a brief discussion of calibration as it relates to different lamps. One of the parameters in the Parameters mode (see Section 2.4 of the user manual) allows selection of lamp setting. Whenever a new lamp is used, the 580B must be calibrated. This is true even if the new lamp is the same type (e.g., the new and old lamp are both 10.0 eV). This is due to the fact that each lamp will have a slightly different sensitivity.

It is important to note that the 11.8 eV lamp will generally be less sensitive than the 10.0 eV lamp. This is true despite the higher energy level of the 11.8 eV lamp. The 11.8 eV lamp will however "see" certain gases which the 10.0 eV lamp will not. See Table E.1 of the user manual for a list of common organic vapors and their associated ionization potentials. Any questions regarding the use of the 580B should be directed to Thermo Environmental's Application Laboratory.

The 580B is quite simple to calibrate. A source of "zero air" and "span gas" are all that is needed to calibrate the 580B. The zero air is introduced to the 580B in order to determine the "background" signal. The concentration of the span gas is then selected. The span gas is finally introduced to the 580B. The instrument makes all of the necessary calculations (including linearization) to arrive at a "calibration constant." When in the Run mode, the signal is multiplied by the calibration constant in order to arrive at the current PPM.

$$\text{CALIBRATION CONSTANT} = \frac{\text{SPAN PPM}}{\text{SPAN SIGNAL} - \text{ZERO SIGNAL}}$$
$$\text{PPM} - (\text{SPAN SIGNAL} - \text{ZERO SIGNAL}) \text{ CALIBRATION CONSTANT}$$

NOTE: The PPM is then multiplied by the RESPONSE FACTOR before being displayed. Chapter four explains the use of response factors when calibrating.

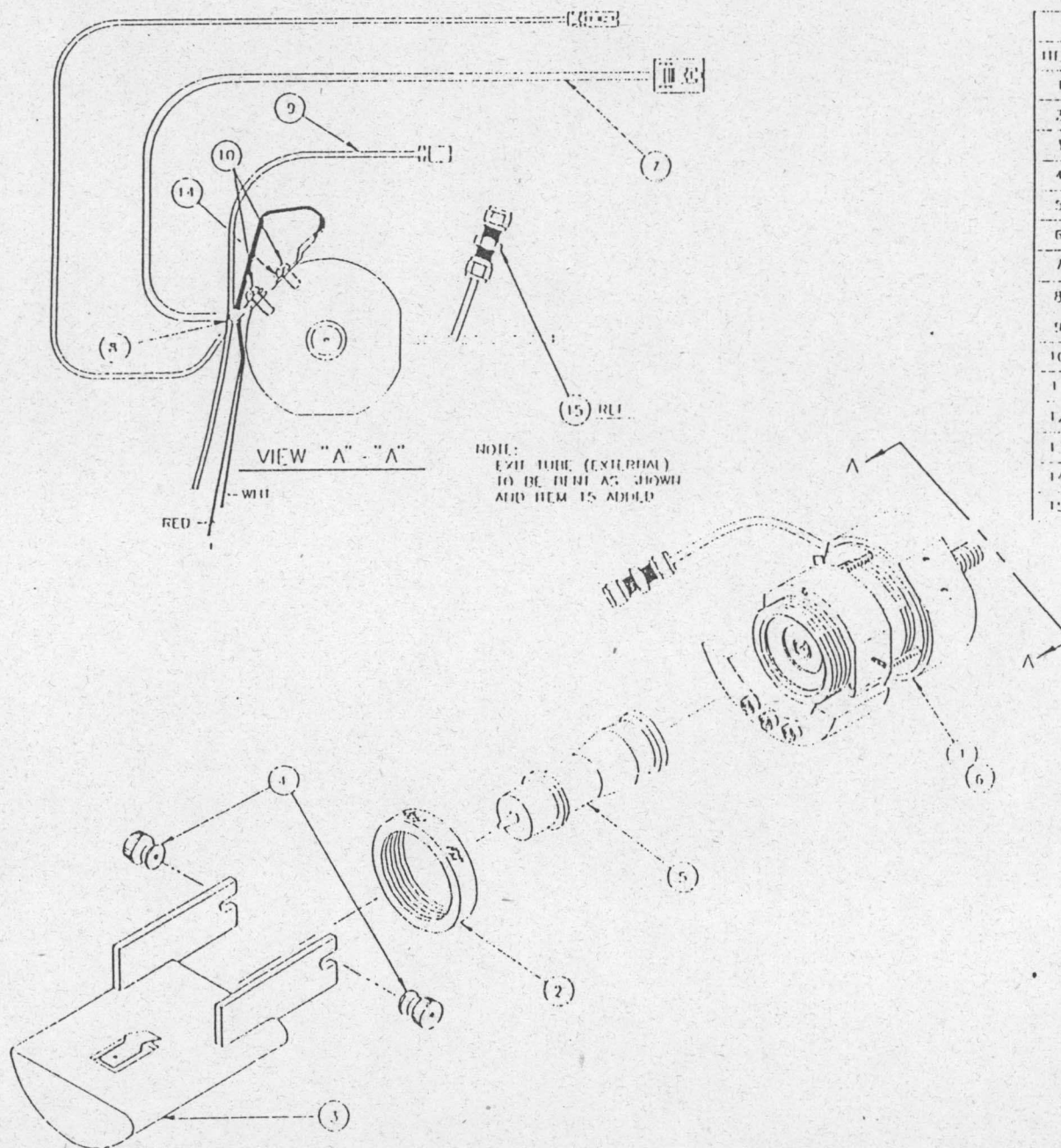
Section 2.4.8 gives a detailed explanation of which buttons to press in order to calibrate the 580B. The flow chart at the back of this manual may also be helpful.

The OVM Model 580B should be calibrated on a daily basis or as needed.

CHARGE

When there is a flashing "B" in the lower left corner of the display (while in the run mode) the battery is low. The battery is recharged by plugging the charger into the RUN/CHARGE plug at the rear of the 580B. The instrument runs while it is charging.

FIGURE 1
Detector Assembly



MATERIAL LIST			
ITEM	PART NO.	DESCRIPTION	QTY
1	5800-6003	DETECTOR SUB ASSY.	1
2	5805-2010	NUT - LAMP (13507)	1
3	5805-6019	PWR. SUPPLY ASSY. (13560)	1
4	12082	NUT - KNURLED	2
5	11929	U.V. LAMP 100	1
6	5805-6035	DETECTOR WIRING ASSY. (13575)	1
7	5800-6001	BASE HARNESS ASSY.	1
8	4166	STRAIN RELIEF	1
9	5805-6028	SIGNAL CABLE (13568)	1
10	5814	1/4-40 X 1/4" UNFINDER HD. SCREW	2
11			
12			
13	5510	TETFLON TUBING 1/8" 6.5" LG	1
14	5588	1/4" HD. TOOTH STAR WASHER	1
15	4417	UNION-20-316	1

K

WRL SAMPLE AIR
MONITORING LOGS

PAGEL'S PIT LANDFILL
DAILY MONITORING LOG - DATE: _____
SENSIDYNE COLORIMETRIC DETECTOR TUBES
TYPE: _____

<u>TIME</u>	<u>LOCATION</u>	<u>READINGS</u>	
		<u>STABILIZED</u>	<u>PEAK</u>
7:00		_____	_____
7:00	Downwind	_____	_____
8:00		_____	_____
8:00	Downwind	_____	_____
9:00		_____	_____
9:00	Downwind	_____	_____
10:00		_____	_____
10:00	Downwind	_____	_____
11:00		_____	_____
11:00	Downwind	_____	_____
12:00		_____	_____
12:00	Downwind	_____	_____
1:00		_____	_____
1:00	Downwind	_____	_____
2:00		_____	_____
2:00	Downwind	_____	_____
3:00		_____	_____
3:00	Downwind	_____	_____
4:00		_____	_____
4:00	Downwind	_____	_____

Comments _____

PAGEL'S PIT LANDFILL
DAILY MONITORING LOG - DATE: _____
OVM PHOTOIONIZER

<u>TIME</u>	<u>LOCATION</u>	<u>READINGS</u>	
		<u>STABILIZED</u>	<u>PEAK</u>
7:00		_____	_____
7:00	Downwind	_____	_____
8:00		_____	_____
8:00	Downwind	_____	_____
9:00		_____	_____
9:00	Downwind	_____	_____
10:00		_____	_____
10:00	Downwind	_____	_____
11:00		_____	_____
11:00	Downwind	_____	_____
12:00		_____	_____
12:00	Downwind	_____	_____
1:00		_____	_____
1:00	Downwind	_____	_____
2:00		_____	_____
2:00	Downwind	_____	_____
3:00		_____	_____
3:00	Downwind	_____	_____
4:00		_____	_____
4:00	Downwind	_____	_____

Comments _____

_____ Calibrated (Span gas of 250 ppm, OVM reading _____ ppm)

PAGEL'S PIT LANDFILL
DAILY MONITORING LOG - DATE: _____
NEOTRONICS MULTIGAS METER - OXYGEN

<u>TIME</u>	<u>LOCATION</u>	<u>READINGS</u>	
		<u>STABILIZED</u>	<u>PEAK</u>
7:00		_____	_____
7:00	Downwind	_____	_____
8:00		_____	_____
8:00	Downwind	_____	_____
9:00		_____	_____
9:00	Downwind	_____	_____
10:00		_____	_____
10:00	Downwind	_____	_____
11:00		_____	_____
11:00	Downwind	_____	_____
12:00		_____	_____
12:00	Downwind	_____	_____
1:00		_____	_____
1:00	Downwind	_____	_____
2:00		_____	_____
2:00	Downwind	_____	_____
3:00		_____	_____
3:00	Downwind	_____	_____
4:00		_____	_____
4:00	Downwind	_____	_____

Comments _____

PAGEL'S PIT LANDFILL
DAILY MONITORING LOG - DATE: _____
NEOTRONICS MULTIGAS METER - LEL

<u>TIME</u>	<u>LOCATION</u>	<u>READINGS</u>	
		<u>STABILIZED</u>	<u>PEAK</u>
7:00		_____	_____
7:00	Downwind	_____	_____
8:00		_____	_____
8:00	Downwind	_____	_____
9:00		_____	_____
9:00	Downwind	_____	_____
10:00		_____	_____
10:00	Downwind	_____	_____
11:00		_____	_____
11:00	Downwind	_____	_____
12:00		_____	_____
12:00	Downwind	_____	_____
1:00		_____	_____
1:00	Downwind	_____	_____
2:00		_____	_____
2:00	Downwind	_____	_____
3:00		_____	_____
3:00	Downwind	_____	_____
4:00		_____	_____
4:00	Downwind	_____	_____

Comments _____

PAGEL'S PIT LANDFILL
DAILY MONITORING LOG - DATE: _____
NEOTRONICS MULTIGAS METER - HYDROGEN SULFIDE

<u>TIME</u>	<u>LOCATION</u>	<u>READINGS</u>	
		<u>STABILIZED</u>	<u>PEAK</u>
7:00		_____	_____
7:00	Downwind	_____	_____
8:00		_____	_____
8:00	Downwind	_____	_____
9:00		_____	_____
9:00	Downwind	_____	_____
10:00		_____	_____
10:00	Downwind	_____	_____
11:00		_____	_____
11:00	Downwind	_____	_____
12:00		_____	_____
12:00	Downwind	_____	_____
1:00		_____	_____
1:00	Downwind	_____	_____
2:00		_____	_____
2:00	Downwind	_____	_____
3:00		_____	_____
3:00	Downwind	_____	_____
4:00		_____	_____
4:00	Downwind	_____	_____

Comments _____

L

WRL JOB TASK HAZARDS

JOB TASK VERSUS POTENTIAL HAZARDS

Potential Health and Safety Hazards	Job Task or operation				
	Excavation and Compaction	Groundwater Extraction	Leachate & Gas Management	Groundwater Sampling	PCA ¹
Inhalation Hazard	X	X	X	X	X
Contact w/Contaminant Liquid		X	X	X	X
Noise Hazard	X			X	
Heat Stress	X				
Potential Fire/Explosion	X		X		
Contact w/Contaminant Soil/Solid	X				
Cold Stress	X			X	
Collapsing Structures on Personal	X				
Physical Injury	X			X	
Overhead Power Lines	X				
Underground Pipes					
Skin Hazards		X	X	X	X
Spillage of Liquids		X	X	X	
Leaks in Lines/Valves		X	X		X

1) PCA - Packed Column Air Stripper

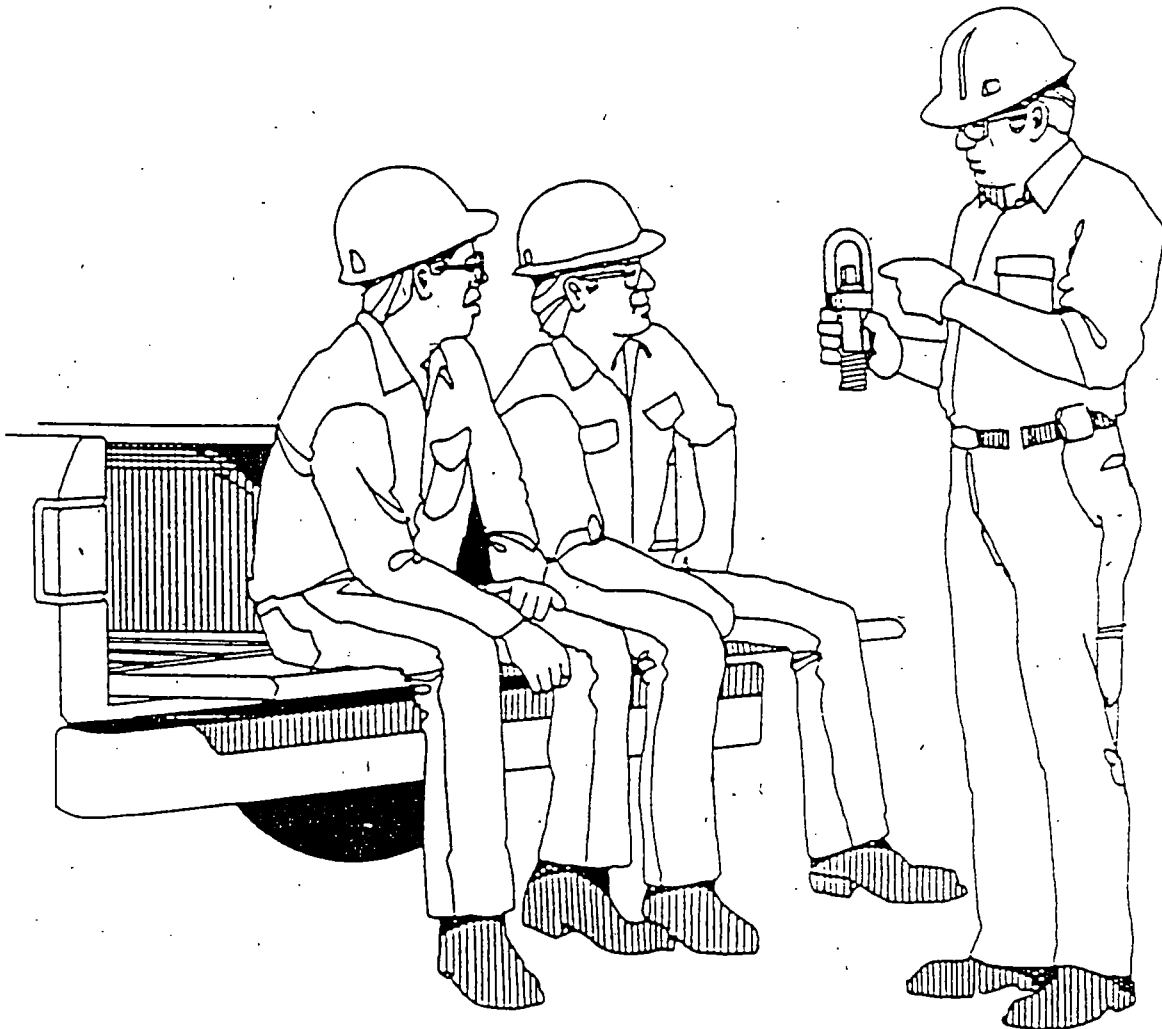
M

SUBCONTRACTOR'S VEHICLE
AND
DRILL RIG SAFETY PLAN

VEHICLE AND RIG SAFETY PLAN

lights and control levers are functioning properly and listen for unusual sounds on each starting of an engine.

- The safety supervisor should assure that all new drill rig workers are informed of safe operating practices on and around the drill rig, and should provide each new drill rig worker with a copy of the organization's drilling operations safety manual, and when appropriate the drill rig manufacturer's operations and maintenance manual. The safety supervisor should assure that each new employee reads and understands the safety manual.



- The safety supervisor should carefully instruct a new worker in drilling safety and observe the new worker's progress towards understanding safe operating practices.

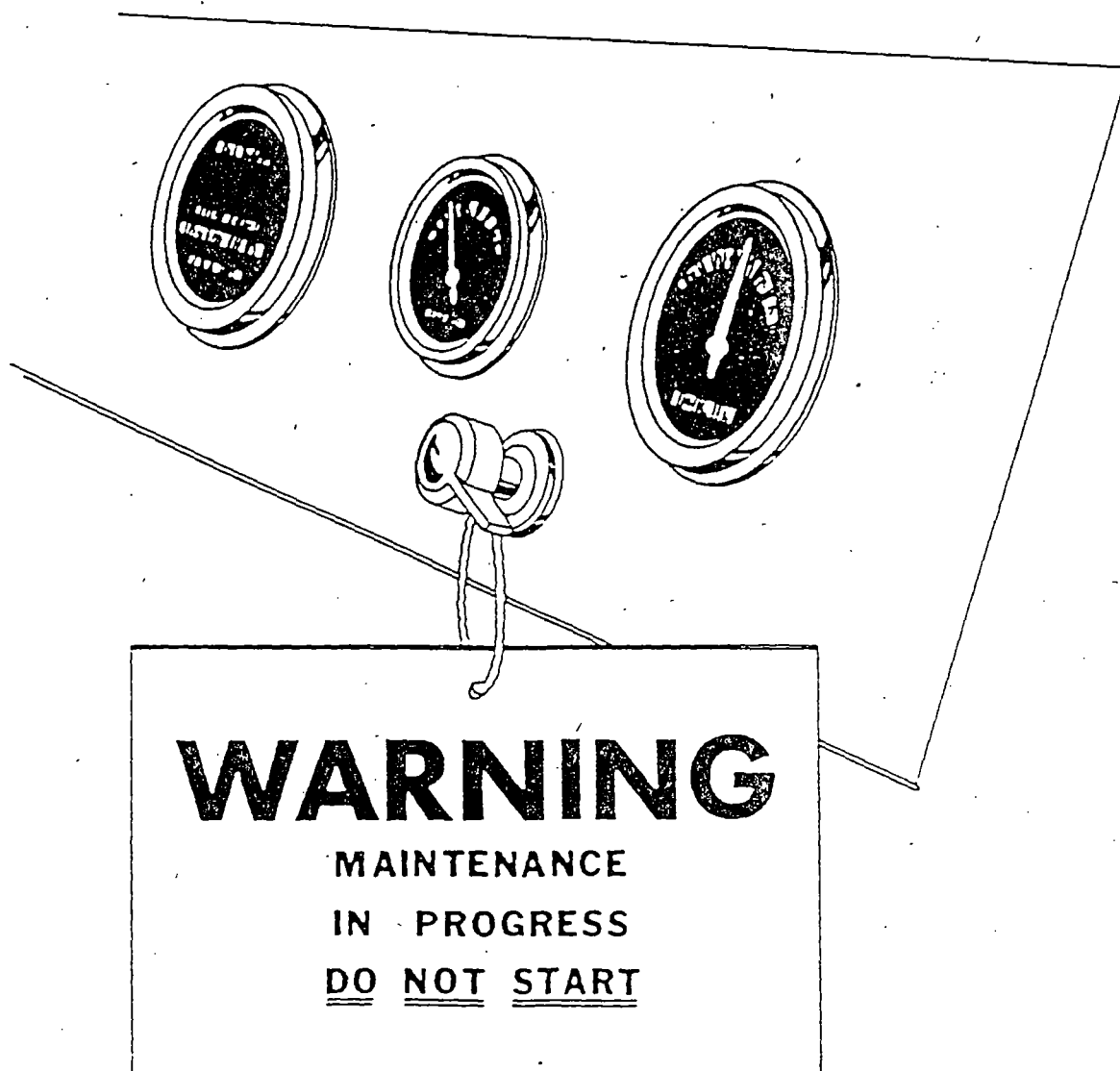
- The safety supervisor should observe the mental, emotional and physical capability of each worker to perform the assigned work in a proper and safe manner. The safety supervisor should dismiss any worker from the drill site whose mental and physical capabilities might cause injury to the worker or coworkers.

- Safety Glasses. All drilling personnel should wear safety glasses. All safety glasses should meet the requirements of ANSI Z87.1.

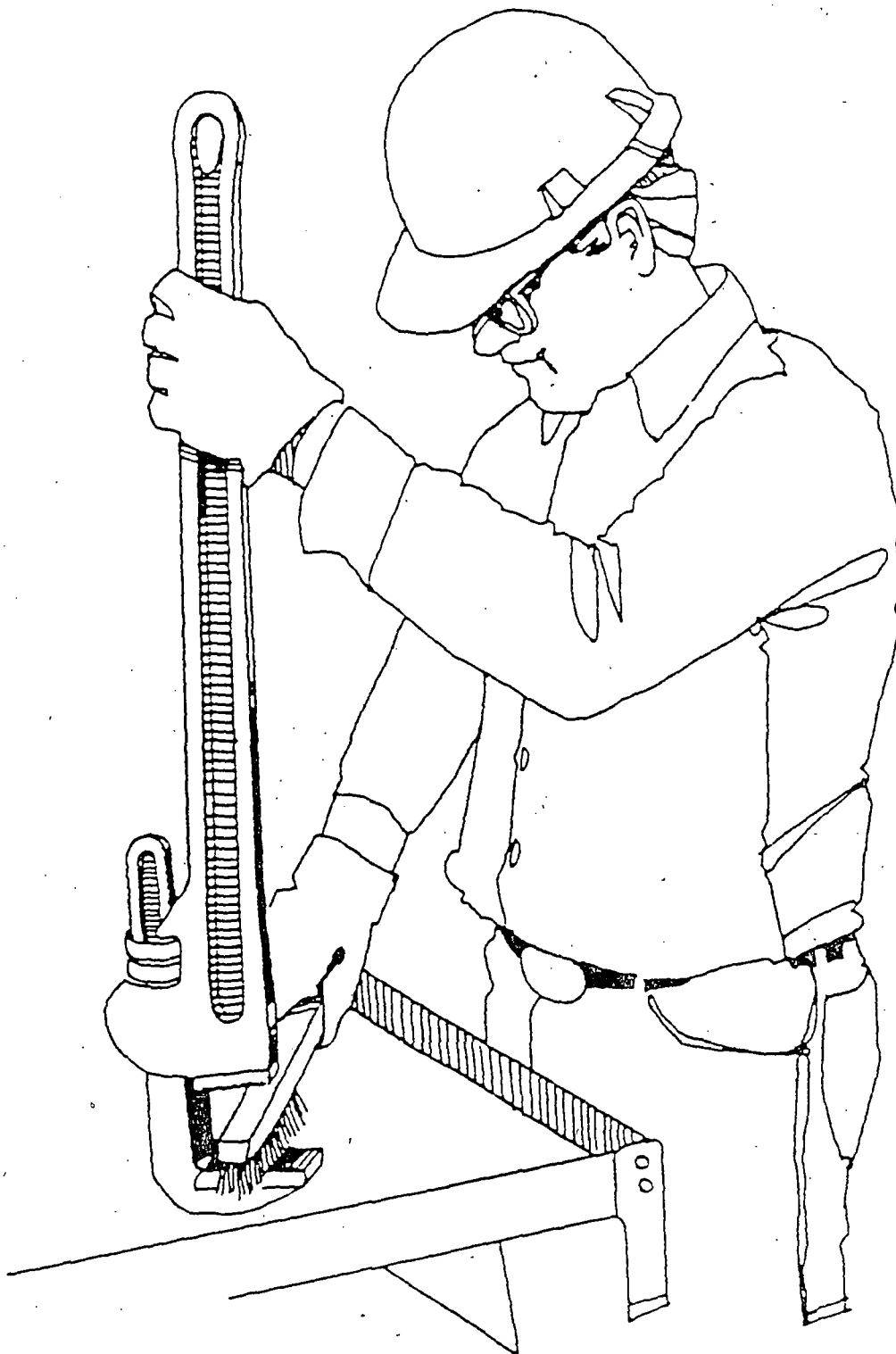


- Other Protective Equipment. For some drilling operations, the environment or regulations may dictate that other protective equipment be used. The requirement for such equipment must be determined jointly by the management of the drilling organization and the safety supervisor. Such equipment might include face or ear protection or reflective clothing. Each drill rig worker should wear noise reducing ear protectors when appropriate. When drilling is performed in chemically or radiologically contaminated ground, special protective equipment and clothing may and probably will be required. The design and composition of the protective equipment and clothing should be determined as a joint effort of management and the client who requests the drilling services.

- Always block the wheels or lower the leveling jacks or both and set hand brakes before working under a drill rig.
- When possible and appropriate, release all pressure on the hydraulic systems, the drilling fluid system and the air pressure systems of the drill rig prior to performing maintenance. In other words, reduce the drill rig and operating systems to a "zero energy state" before performing maintenance. Use extreme caution when opening drain plugs and radiator caps and other pressurized plugs and caps.
- Do not touch an engine or the exhaust system of an engine following its operation until the engine and exhaust system have had adequate time to cool.



- Never weld or cut on or near a fuel tank.
- Do not use gasoline or other volatile or flammable liquids as a cleaning agent on or around a drill rig.
- Follow the manufacturer's recommendations for applying the prop-



- When breaking tool joints on the ground or on a drilling platform, position your hands so that your fingers will not be smashed between the wrench handle and the ground or the platform, should the wrench slip or the joint suddenly let go.

8. Clearing The Work Area

Prior to drilling, adequate site clearing and leveling should be performed to accommodate the drill rig and supplies and provide a

- The operator of a drill rig should only operate a drill rig from the position of the controls. If the operator of the drill rig must leave the area of the controls, the operator should shift the transmission controlling the rotary drive into neutral and place the feed control lever in neutral. The operator should shut down the drill engine before leaving the vicinity of the drill.

- Throwing or dropping tools should not be permitted. All tools should be carefully passed by hand between personnel or a hoist line should be used.

- Do not consume alcoholic beverages or other depressants or chemical stimulants prior to starting work on a drill rig or while on the job.

- If it is necessary to drill within an enclosed area, make certain that exhaust fumes are conducted out of the area. Exhaust fumes can be toxic and some cannot be detected by smell.

- Clean mud and grease from your boots before mounting a drill platform and use hand holds and railings. Watch for slippery ground when dismounting from the platform.

- During freezing weather, do not touch any metal parts of the drill rig with exposed flesh. Freezing of moist skin to metal can occur almost instantaneously.

- All air and water lines and pumps should be drained when not in use if freezing weather is expected.

- All unattended boreholes must be adequately covered or otherwise protected to prevent drill rig personnel, site visitors or animals from stepping or falling into the hole. All open boreholes should be covered, protected or backfilled adequately and according to local or state regulations on completion of the drilling project.

- "Horsing around" within the vicinity of the drill rig and tool and supply storage areas should never be allowed, even when the drill rig is shut down.

- When using a ladder on a drill rig, face the ladder and grasp either the side rails or the rungs with both hands while ascending or descending. Do not attempt to use one or both hands to carry a tool while on a ladder. Use a hoist line and a tool "bucket" or a safety hook to raise or lower hand tools.

An elevated derrick platform should be used with the following precautions:

- If a heavy object must be moved some distance without the aid of machinery, keep your back straight and unarched. Change directions by moving your feet, not by twisting your body.

- Move heavy objects with the aid of hand carts whenever possible.

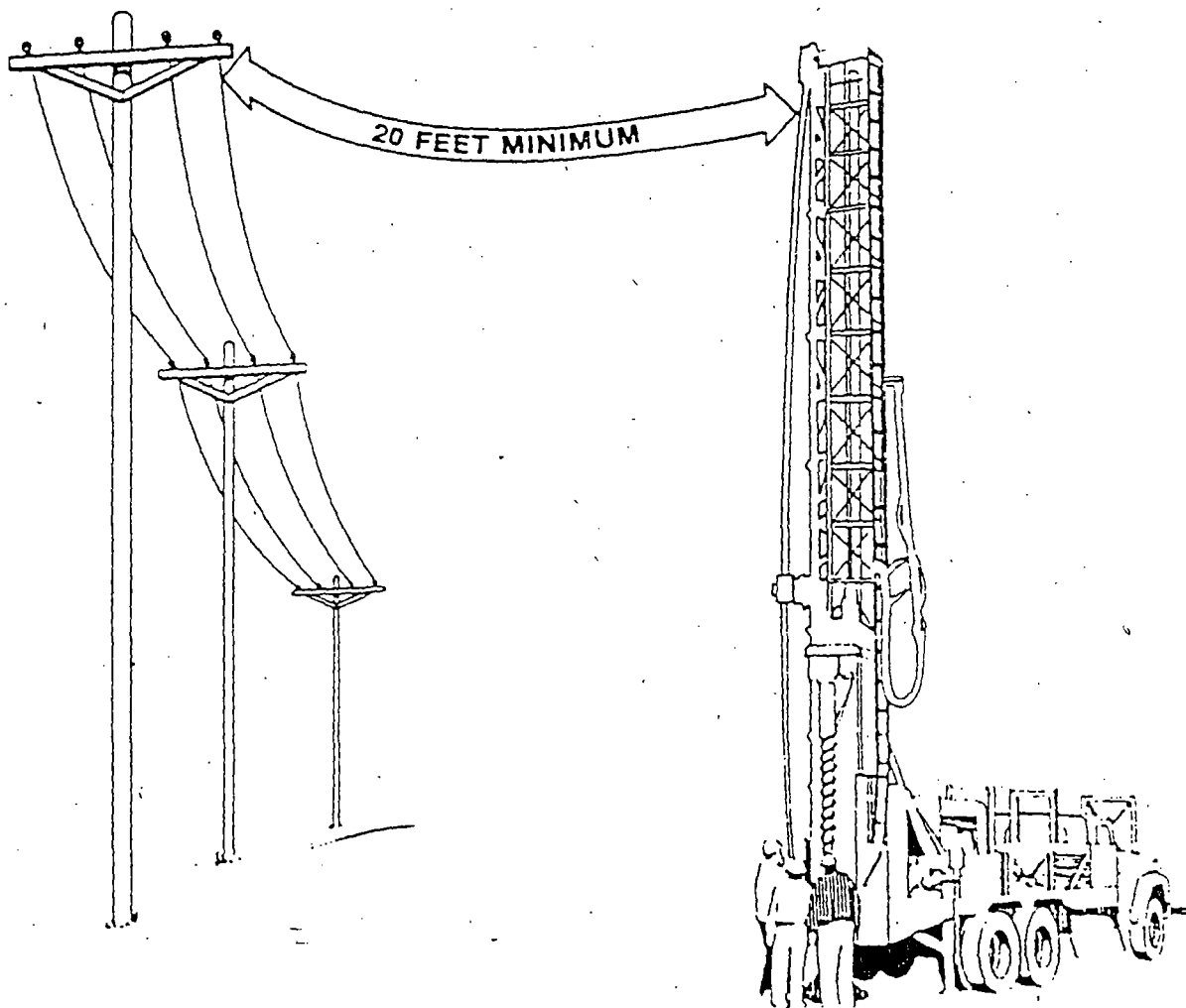
Drilling operations should be terminated during an electrical storm and the complete crew should move away from the drill rig.

II. Overhead And Buried Utilities

The use of a drill rig on a site or project within the vicinity of electrical power lines and other utilities requires that special precautions be taken by both supervisors and members of the exploration crew. Electricity can shock, it can burn and it can cause death.

- Overhead and buried utilities should be located, noted and emphasized on all boring location plans and boring assignment sheets.

- When overhead electrical power lines exist at or near a drilling site or project, consider all wires to be alive and dangerous.



power line will be when the mast is raised and/or being raised. Do not raise the mast or operate the drill rig if this distance is less than 20 ft. (6 m), or if known, the minimum clearance stipulated by federal, state and local regulations.

- Keep in mind that both hoist lines and overhead power lines can be moved toward each other by the wind.

- In order to avoid contact with power lines, only move the drill rig with the mast (derrick) down.

- If there are any questions whatever concerning the safety of drilling on sites in the vicinity of overhead power lines, call the power company. The power company will provide expert advice at the drilling site as a public service and at no cost.

Underground electricity is as dangerous as overhead electricity. Be aware and always suspect the existence of underground utilities such as electrical power, gas, petroleum, telephone, sewer and water. Ask for assistance:

- If a sign warning of underground utilities is located on a site boundary, do not assume that underground utilities are located on or near the boundary or property line under the sign: call the utility and check it out. The underground utilities may be a considerable distance away from the warning sign.

- Always contact the owners of utility lines or the nearest underground utility location service before drilling. Determine jointly with utility personnel the precise location of underground utility lines, mark and flag the locations and determine jointly with utility personnel what specific precautions must be taken to assure safety.

12. Safe Use Of Electricity

Drilling projects sometimes require around-the-clock operations and, therefore, require temporary electrical lighting. In general, all wiring and fixtures used to provide electricity for drilling operations should be installed by qualified personnel in accordance with the National Electrical Code (NFPA70-1984) with consideration of the American Petroleum Institute's recommended practices for electrical installations for production facilities (API-RP-500B). Lights should be installed and positioned to assure that the work area and operating

drilling environment. Makeshift wiring and equipment should not be permitted.

- All lights positioned directly above working areas should be enclosed in cages or similar enclosures to prevent loose or detached lamps or vaportight enclosures from falling on workers.

- Lights should be installed to produce the least possible glare or "blind spots" on tools, ladders, walkways, platforms and the complete working area.

- Electrical cables should be guarded and located to prevent damage by drilling operations or by the movement of personnel, tools or supplies.

- All plug receptacles should be the three-prong, U-blade, grounded type and have adequate current carrying capacity for the electrical tools that may be used.

- All electric tools should have three-prong, U-blade, ground wire plugs and cords.

- Do not use electrical tools with lock-on devices.

- All electrical welders, generators, control panels and similar devices should be adequately grounded.

- Control panels, fuse boxes, transformers and similar equipment should have a secure, protective enclosure.

- Avoid attaching electrical lighting cables to the derrick or other components of the drill rig. If this must be done, use only approved fasteners. Do not "string" wire through the derrick.

- Poles used to hold wiring and lights should not be used for any other purpose.

- Power should be turned off before changing fuses or light bulbs.

- When a drilling area is illuminated with electrical lighting, all workers should wear safety head gear that protects the worker's head, not only against falling or flying objects, but also against limited electrical shock and burn according to ANSI Z89.1 and Z89.2.

- Electrical equipment should only be operated by trained, designated personnel.

- If you are not qualified to work on electrical devices or on electric lines, do not go near them.

- All wire ropes and fittings should be visually inspected during use and thoroughly inspected at least once a week for: abrasion, broken wires, wear, reduction in rope diameter, reduction in wire diameter, fatigue, corrosion, damage from heat, improper reeving, jamming, crushing, bird caging, kinking, core protrusion and damage to lifting hardware. Wire ropes should be replaced when inspection indicates excessive damage according to the Wire Rope Users Manual. All wire ropes which have not been used for a period of a month or more should be thoroughly inspected before being returned to service.

- End fittings and connections consist of spliced eyes and various manufactured devices. All manufactured end fittings and connections should be installed according to the manufacturer's instructions and loaded according to the manufacturer's specifications.

- If a ball-bearing type hoisting swivel is used to hoist drill rods, swivel bearings should be inspected and lubricated daily to assure that the swivel freely rotates under load.

- If a rod slipping device is used to hoist drill rods, do not drill through or rotate drill rods through the slipping device, do not hoist more than 1 ft. (0.3 m) of the drill rod column above the top of the mast (derrick), do not hoist a rod column with loose tool joints and do not make up, tighten or loosen tool joints while the rod column is being supported by a rod slipping device. If drill rods should slip back into the borehole, do not attempt to brake the fall of the rods with your hands or by tensioning the slipping device.

- Most sheaves on exploration drill rigs are stationary with a single part line. The number of parts of line should not ever be increased without first consulting with the manufacturer of the drill rig.

- Wire ropes must be properly matched with each sheave – if the rope is too large, the sheave will pinch the wire rope – if the rope is too small, it will groove the sheave. Once the sheave is grooved, it will severely pinch and damage larger sized wire ropes.

The following procedures and precautions must be understood and implemented for safe use of wire ropes and rigging hardware.

- Use tool handling hoists only for vertical lifting of tools (except when angle hole drilling). Do not use tool handling hoists to pull on objects away from the drill rig; however, drills may be moved using the main hoist if the wire rope is spooled through proper

- Never use a hoist line to "ride" up the mast (derrick) of a drill rig.
- Replacement wire ropes should conform to the drill rig manufacturer's specifications.

15. Safe Use Of Cathead And Rope Hoists

The following safety procedures should be employed when using a cathead hoist.

- Keep the cathead clean and free of rust and oil and/or grease. The cathead should be cleaned with a wire brush if it becomes rusty.
- Check the cathead periodically, when the engine is not running, for rope wear grooves. If a rope groove forms to a depth greater than 1/8 in. (3 mm), the cathead should be replaced.
- Always use a clean, dry, sound rope. A wet or oily rope may "grab" the cathead and cause drill tools or other items to be rapidly hoisted to the top of the mast.
- Should the rope "grab" the cathead or otherwise become tangled in the drum, release the rope and sound an appropriate alarm for all personnel to rapidly back away and stay clear. The operator should also back away and stay clear. If the rope "grabs" the cathead, and tools are hoisted to the sheaves at the top of the mast, the rope will often break, releasing the tools. If the rope does not break, stay clear of the drill rig until the operator cautiously returns to turn off the drill rig engine and appropriate action is taken to release the tools. The operator should keep careful watch on the suspended tools and should quickly back away after turning off the engine.
- The rope should always be protected from contact with all chemicals. Chemicals can cause deterioration of the rope that may not be visibly detectable.
- Never wrap the rope from the cathead (or any other rope, wire rope or cable on the drill rig) around a hand, wrist, arm, foot, ankle, leg or any other part of your body.
- Always maintain a minimum of 18 inches of clearance between the operating hand and the cathead drum when driving samplers, casing or other tools with the cathead and rope method. Be aware that the rope advances toward the cathead with each hammer blow as

- Do not use more rope wraps than are required to hoist a load.
- Do not leave a cathead unattended with the rope wrapped on the drum.
- Position all other hoist lines to prevent contact with the operating cathead rope.
- When using the cathead and rope for driving or back-driving, make sure that all threaded connections are tight and stay as far away as possible from the hammer impact point.
- The cathead operator must be able to operate the cathead standing on a level surface with good, firm footing conditions without distraction or disturbance.

16. Safe Use Of Augers

The following general procedures should be used when starting a boring with continuous flight or hollow-stem augers:

- Prepare to start an auger boring with the drill rig level; the clutch or hydraulic rotation control disengaged, the transmission in low gear and the engine running at low RPM.
- Apply an adequate amount of down pressure prior to rotation to seat the auger head below the ground surface.
- Look at the auger head while slowly engaging the clutch or rotation control and starting rotation. Stay clear of the auger.
- Slowly rotate the auger and auger head while continuing to apply down pressure. Keep one hand on the clutch or the rotation control at all times until the auger has penetrated about one foot or more below ground surface.
- If the auger head slides out of alignment, disengage the clutch or hydraulic rotation control and repeat the hole starting process.
- An auger guide can facilitate the starting of a straight hole through hard ground or a pavement.

The operator and tool handler should establish a system of responsibility for the series of various activities required for auger drilling, such as connecting and disconnecting auger sections, and inserting and removing the auger fork. The operator must assure that the tool handler is well away from the auger column and that the auger fork is removed before starting rotation.

- Drill rods should not be held or lowered into the hole with pipe wrenches.

- If a string of drill rods are accidentally or inadvertently released into the hole, do not attempt to grab the falling rods with your hands or a wrench.

- In the event of a plugged bit or other circulation blockage, the high pressure in the piping and hose between the pump and the obstruction should be relieved or bled down before breaking the first tool joint.

- When drill rods are hoisted from the hole, they should be cleaned for safe handling with a rubber or other suitable rod wiper. Do not use your hands to clean drilling fluids from drill rods.

- If work must progress over a portable drilling fluid (mud) pit, do not attempt to stand on narrow sides or cross members. The mud pit should be equipped with rough surfaced, fitted cover panels of adequate strength to hold drill rig personnel.

- Drill rods should not be lifted and leaned unsecured against the mast. Either provide some method of securing the upper ends of the drill rod sections for safe vertical storage or lay the rods down.

18. Safety During Travel

The individual who transports a drill rig on and off a drilling site should:

- Be properly licensed and should only operate the vehicle according to federal, state and local regulations.

- Know the traveling height (overhead clearance), width, length and weight of the drill rig with carrier and know highway and bridge load, width and overhead limits, making sure these limits are not exceeded with an adequate margin.

- Never move a drill rig unless the vehicle brakes are in sound working order.

- Allow for mast overhang when cornering or approaching other vehicles or structures.

- Be aware that the canopies of service stations and motels are often too low for a drill rig mast to clear with the mast in the travel position.

19. Loading And Unloading

When loading or unloading a drill rig on a trailer or a truck:

- Use ramps of adequate design that are solid and substantial enough to bear the weight of the drill rig with carrier – including tooling.

- Load and unload on level ground.
- Use the assistance of someone on the ground as a guide.
- Check the brakes on the drill rig carrier before approaching loading ramps.

- Distribute the weight of the drill rig, carrier and tools on the trailer so that the center of weight is approximately on the center-line of the trailer and so that some of the trailer load is transferred to the hitch of the pulling vehicle. Refer to the trailer manufacturer's weight distribution recommendations.

- The drill rig and tools should be secured to the hauling vehicle with ties, chains and/or load binders of adequate capacity.

20. Off-Road Movement

The following safety suggestions relate to off-road movement:

- Before moving a drill rig, first walk the route of travel, inspecting for depressions, stumps, gulleys, ruts and similar obstacles.

- Always check the brakes of a drill rig carrier before traveling, particularly on rough, uneven or hilly ground.

- Check the complete drive train of a carrier at least weekly for loose or damaged bolts, nuts, studs, shafts and mountings.

- Discharge all passengers before moving a drill rig on rough or hilly terrain.

- Engage the front axle (for 4 x 4, 6 x 6, etc. vehicles or carriers) when traveling off highway on hilly terrain.

- Use caution when traveling side-hill. Conservatively evaluate side-hill capability of drill rigs, because the arbitrary addition of drilling tools may raise the center of mass. When possible, travel directly uphill or downhill. Increase tire pressures before traveling in hilly terrain (do not exceed rated tire pressure).

- Attempt to cross obstacles such as small logs and small erosion

prior to charging to permit the escape of gas.

- Spilled battery acid can burn your skin and damage your eyes. Spilled battery acid should be immediately flushed off of your skin with lots of water. Should battery acid get into someone's eyes, flush immediately with large amounts of water and see a medical physician at once.

- To avoid battery explosions, keep the cells filled with electrolyte, use a flashlight (not an open flame) to check electrolyte levels and avoid creating sparks around the battery by shorting across a battery terminal. Keep lighted smoking materials and flames away from batteries.

Special precautions must be taken for handling fuel and refueling the drill rig or carrier.

- Only use the type and quality of fuel recommended by the engine manufacturer.

- Refuel in a well-ventilated area.

- Do not fill fuel tanks while the engine is running. Turn off all electrical switches.

- Do not spill fuel on hot surfaces. Clean any spillage before starting an engine.

- Wipe up spilled fuel with cotton rags or cloths – do not use wool or metallic cloth.

- Keep open lights, lighted smoking materials and flames or sparking equipment well away from the fueling area.

- Turn off heaters in carrier cabs when refueling the carrier or the drill rig.

- Do not fill portable fuel containers completely full to allow expansion of the fuel during temperature changes.

- Keep the fuel nozzle in contact with the tank being filled to prevent static sparks from igniting the fuel.

- Do not transport portable fuel containers in the vehicle or carrier cab with personnel.

- Fuel containers and hoses should remain in contact with a metal surface during travel to prevent the buildup of static charge.

N

DAILY SAFETY CHECKLIST

SITE HEALTH AND SAFETY CHECKLIST - DAILY

Date: _____ Checklist completed by: _____
Project number: _____ Project name: _____
Location: _____
Site Manager: _____ Site Safety Officer: _____
Weather: ☐ windy ☐ fair ☐ cloudy ☐ dry ☐ rain ☐ sleet
☐ snow temperature: _____ °C / °F

Topic covered?

- ☐ Yes ☐ No ☐ N/A Site hazards
- ☐ Yes ☐ No ☐ N/A • General site health and safety hazards
- ☐ Yes ☐ No ☐ N/A • Specific hazards associated with substances of concern
- ☐ Yes ☐ No ☐ N/A • Routes of exposure
- ☐ Yes ☐ No ☐ N/A • Specific hazards associated with a task/job
- ☐ Yes ☐ No ☐ N/A • Physical stresses/hazards
- ☐ Yes ☐ No ☐ N/A • "Buddy" system
-
- ☐ Yes ☐ No ☐ N/A Site Safety Plan
- ☐ Yes ☐ No ☐ N/A • Role/duties of Site Safety Officer (SSO)
- ☐ Yes ☐ No ☐ N/A • Ambient air monitoring
- ☐ Yes ☐ No ☐ N/A • Emergency procedures/hospital routes
-
- ☐ Yes ☐ No ☐ N/A Personal Protection
- ☐ Yes ☐ No ☐ N/A • Required PPE
- ☐ Yes ☐ No ☐ N/A • SCBA/Air-supplying respirator review
- ☐ Yes ☐ No ☐ N/A • Proper donning/doffing techniques
-
- ☐ Yes ☐ No ☐ N/A Decontamination
- ☐ Yes ☐ No ☐ N/A • Overview of station(s)
- ☐ Yes ☐ No ☐ N/A • Proper techniques
- ☐ Yes ☐ No ☐ N/A • Field equipment decontamination
- ☐ Yes ☐ No ☐ N/A • Heavy equipment/machinery decontamination
- ☐ Yes ☐ No ☐ N/A • Vehicle movement
- ☐ Yes ☐ No ☐ N/A • Personal hygiene

Health and Safety Meeting Attendance

Date _____

Name

Employer

Signature

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